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The Specific Action of the Various Acids on Wool

Part I

The Action of Sulphuric, Hydrochloric, Phosphoric, Nitric, Chromic, Acetic and Tannic Acids on Wool.

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IN the foregoing papers, and particularly in the immediately previous paper, "The General Action of the Acids on Wool,"† the action of the various individual acids on wool has been considered in a more or less general way. In the present paper an attempt will be made to complete this review of the action of the various more common acids on wool, with the exception of sulphurous and nitrous acids. On account of the difference in the action and uses of these acids on the wool fiber, these two acids will be considered separately in later papers.

As sulphuric acid is not only our cheapest and most common acid, but is also used upon wool to a larger extent than any other single acid, its action upon the wool fiber will be considered first. It is well known that sulphuric acid is the commonly used acid in most carbonizing and dyeing operations. While a great deal of wool is carbonized in America by the aluminum chloride process to a great advantage over the sulphuric acid process, the lower cost and greater simplicity of the acid process over the aluminum chloride process still keeps the older acid process in most common use. Apparently the aluminum chloride carbonizing process is not used to any great extent in Europe and England at present.

In view of the frequently quoted work of Scott on the effect of the hydrogen ion concentration factor in dyeing silk with acid dyestuffs, American Dyestuff Reporter 14, 862-5 (1925), as well as other work along similar lines, it appears probable that sulphuric or other suitable mineral acid, properly buffered, may be substituted for the more expensive acetic acid in many processes such as wool dyeing, etc. Where the effect is largely or entirely dependent upon the hydrogen ion concentration of the solution, other factors, of course, remaining constant. In this connection Tables XXXV-A to XXXV-C are of interest in that they show the relation between the total acid present and the hydrogen ion concentration, as pH, for the various acids, while Table XXXV-D gives the ionization constants of a number of acids and bases. All of these tables are abbreviated from "Van Nostrand's Chem-

TABLE XXXV-A

Ionization of Hydrochloric and Nitric Acids at 25 Deg. Cent. (77 Deg. Fahr.)

Moles Acid per Liter	Hydrochloric Acid			Nitric Acid		
	P. C. Ionized	Moles H^+ per Liter	pH	P. C. Ionized	Moles H^+ per Liter	pH
2.0.....	69.3	1.386	—0.14	73.9	1.478	—0.17
1.0.....	79.6	0.796	+0.10	84.8	0.848	+0.07
0.9.....	81.5	0.734	0.13	....	....	..
0.8.....	83.3	0.666	0.18	....	....	....
0.7.....	84.7	0.593	0.23	....	....	....
0.6.....	86.5	0.519	0.28	....	....	....
0.5.....	87.5	0.438	0.36	87.9	0.439	0.36
0.4.....	88.7	0.355	0.45	89.4	0.353	0.45
0.3.....	90.1	0.270	0.57	90.7	0.272	0.57
0.2.....	92.0	0.184	0.74	92.9	0.182	0.73
0.10.....	94.8	0.095	1.02	96.0	0.096	1.02
0.08.....	95.6	0.076	1.12	96.8	0.077	1.11
0.06.....	96.4	0.058	1.24	97.6	0.059	1.23
0.04.....	97.6	0.039	1.41	98.7	0.039	1.41
0.02.....	98.8	0.020	1.70	99.3	0.020	1.70
0.010.....	99.8	0.010	2.00	99.3	0.0099	2.00
0.008.....	100.0	0.008	2.10	99.3	0.0079	2.10
0.006.....	100.0	0.006	2.22	99.4	0.0050	2.22
0.004.....	100.0	0.004	2.40	99.4	0.0040	2.40
0.002.....	100.0	0.002	2.70	99.5	0.0020	2.70
0.001.....	100.0	0.001	3.00	100.0	0.0010	3.00

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†American Dyestuff Reporter, Vol. XV, 1926, p. 779.

ical Annual," by John C. Olsen, sixth edition (1926), pages 74 to 78.

TABLE XXXV-B

Ionization of Sulphuric and Phosphoric Acids at 25 Deg. Cent. (77 Deg. Fahr.)

	Sulphuric Acid			Phosphoric Acid		
Moles Acid per Liter	P. C. Ionized	Moles H^+ per Liter	pH	P. C. Ionized	Moles H^+ per Liter	pH
2.0.....	39.9	1.596	—0.20	16.1	0.322	0.49
1.0.....	50.7	1.014	—0.01	17.5	0.175	0.76
0.8.....	51.4	0.822	+0.09	17.9	0.143	0.84
0.6.....	52.9	0.635	0.20	18.8	0.113	0.95
0.5.....	53.6	0.536	0.27	19.0	0.095	1.02
0.4.....	54.7	0.438	0.36	19.8	0.079	1.10
0.2.....	57.6	0.230	0.64	22.8	0.046	1.34
0.1.....	60.7	0.121	0.92	27.5	0.028	1.55
0.08.....	61.7	0.099	1.00	30.0	0.024	1.62
0.06.....	63.5	0.076	1.12	33.0	0.020	1.70
0.04.....	66.8	0.053	1.28	38.0	0.015	1.82
0.02.....	73.1	0.029	1.54	47.5	0.010	2.00
0.010.....	79.6	0.0159	1.80	59.0	0.0059	2.23
0.008.....	81.8	0.0131	1.88	63.0	0.0050	2.30
0.006.....	84.2	0.0101	2.00	67.5	0.0041	2.39
0.004.....	88.0	0.0070	2.15	73.5	0.0029	2.54
0.002.....	94.7	0.0038	2.42	83.0	0.0017	2.77
0.001.....	97.7	0.0020	2.70	89.0	0.0009	3.05

TABLE XXXV-C

Ionization of Formic and Acetic Acids at 25 Deg. Cent. (77 Deg. Fahr.)

	Formic Acid			Acetic Acid		
Moles Acid per Liter	P. C. Ionized	Moles H^+ per Liter	pH	P. C. Ionized	Moles H^+ per Liter	pH
2.0.....	1.03	0.0206	1.69	0.30	0.00600	2.22
1.0.....	1.5	0.0150	1.82	0.37	0.00370	2.43
0.8.....	1.7	0.0136	1.87	0.42	0.00336	2.47
0.6.....	1.9	0.0014	1.94	0.5	0.00300	2.52
0.4.....	2.3	0.0092	2.04	0.6	0.00240	2.62
0.2.....	3.2	0.0064	2.19	0.9	0.00180	2.74
0.1.....	4.5	0.0045	2.35	1.3	0.00130	2.89
0.08.....	5.0	0.0040	2.40	1.5	0.00120	2.92
0.06.....	5.8	0.0035	2.46	1.7	0.00102	2.99
0.04.....	7.1	0.0028	2.55	2.1	0.00084	3.08
0.02.....	9.7	0.0019	2.72	3.0	0.00060	3.22
0.010.....	13.4	0.00134	2.87	4.2	0.00042	3.38
0.008.....	14.8	0.00118	2.93	4.7	0.00038	3.42
0.006.....	16.6	0.00100	3.00	5.4	0.00032	3.49
0.004.....	20.1	0.00080	3.10	6.6	0.00026	3.58
0.002.....	27.1	0.00054	3.27	9.2	0.00018	3.74
0.001.....	35.8	0.00036	3.44	12.8	0.00013	3.89

Bowman, "The Structure of the Wool Fiber" (1885), page 197, says that on heating wool with strong sulphuric acid the fibers swell out and partially dissolve. On diluting this solution with water and neutralizing it with alkali, it becomes turbid. When wool is boiled for some time with weak sulphuric acid, the solution yields tyrosine, leucine, ammonia and other compounds.

Knecht, with Furstenhagen and Appleyard, *J. Soc. Dyers and Colourists 4*, 104-106 (1888), studied the absorption of acids by wool and found that on treating 5 grams of wool in 500 c.c. of water containing various amounts of acid at 100 deg. Cent. (212 deg. Fahr.) for one hour the acid was absorbed, as shown in Table XXXVI.

TABLE XXXV-D

Ionization Constants of Acids and Bases

Reagent	Deg. Cent.	H^+	Ka	Kb
Acetic acid	0	....	1.75×10^{-5}	
Acetic acid	10	....	1.83×10^{-5}	
Acetic acid	18	....	1.82×10^{-5}	
Acetic acid	25	....	1.86×10^{-5}	
Aluminum hydroxide.	25	....	6.3×10^{-13}	
Ammonium hydroxide	0	....		1.4×10^{-5}
Formic acid	..	....	2.1×10^{-4}	
Hydrogen peroxide ..	25	....	2.4×10^{-12}	
Hydrogen sulphide ..	18	1st	9.1×10^{-8}	
Hypochlorous acid ..	25	....	6.7×10^{-10}	
Oxalic acid	25	1st	3.8×10^{-2}	
Oxalic acid	25	2nd	3.0×10^{-5}	
Phosphoric acid	18	1st	1.1×10^{-2}	
Phosphoric acid	18	2nd	2.0×10^{-7}	
Phosphoric acid	18	3rd	3.6×10^{-13}	
Sulphuric acid	25	1st	4.0×10^{-1}	
Sulphuric acid	18	2nd	1.9×10^{-2}	
Sulphurous acid	25	1st	1.7×10^{-2}	
Sulphurous acid	25	2nd	5.0×10^{-6}	
Zinc hydroxide	25	2nd		1.5×10^{-9}

TABLE XXXVI

Absorption of Sulphuric Acid by Wool

Percentage of Acid (On weight of wool)	Acid Left in Solution	Acid Absorbed	Indicator
2.5.....	0.38%	2.12%	Methyl Orange
5.0.....	1.77	2.83	Methyl Orange
10.0.....	6.37	3.63	Methyl Orange
20.0.....	15.87	4.13	Methyl Orange
40.0.....	35.18	4.82	Methyl Orange

On boiling a sample of wool for an hour in 5 per cent sulphuric acid, removing, washing lightly in distilled water (back into the original solution) and boiling for an hour in distilled water for the purpose of removing the absorbed acid, the following amounts of acid were removed: Acid left in solution, 1.40 per cent; acid removed by first boiling out, 0.84 per cent; acid removed by second boiling out, 0.34 per cent; acid removed by third boiling out, 0.08 per cent; total of free acid boiled out, 1.26 per cent. Adding this 1.26 per cent to the 1.40 per cent of acid left in solution, we have 2.66 per cent of acid accounted for, and Knecht believes that the remaining 2.34 per cent of this acid is permanently absorbed or neutralized by the wool.

The *Textile Recorder 22*, 229 (1904), says that when wool is treated with cold, strong sulphuric acid it loses all affinity for the acid dyestuffs, while it strongly attracts the basic dyes. In order to remove the strong acid without the generation of heat, which causes a disintegration of the fiber, they found it necessary to pass the wool

through a series of baths, each successive bath containing more dilute acid than the previous one.

This resisting action of strong sulphuric acid on wool was probably first pointed out by Von Georgievics in the first edition (1902) of his "Chemical Technology of Textile Fibers," and forms the basis of Badische's French Patent No. 318,741 on a process of resisting wool to acid dyestuffs by means of an acid treatment. German Patent No. 168,026 to Becke and Beil covers a somewhat similar process.

Gelmo and Suida, *Sitzungs Ber. d. Kaiserl. Akad. d. Wissenchaften,* May, 1905, made an extensive study of the effect of acid treatment upon the affinity of wool for various dyestuffs. They found that acid treatment diminishes the affinity of the wool for basic dyestuffs to a marked extent, whereas the affinity for acid dyestuffs, from a neutral solution, is much increased. However, the mode of washing the treated wool has considerable influence upon the result obtained. After treating the wool with alcoholic sulphuric acid, the affinity of the wool for basic dyestuffs is much increased by washing in warm water; but in the case of wool treated with aqueous sulphuric acid, the affinity is less when hot rinse water is used than with a cold rinse. In the case of acid dyestuffs, whether the acid is applied in aqueous or alcoholic solution, the affinity of the wool is greater when washed with warm water than it is after washing with cold water.

One of the most noticeable features in this connection is the decreased affinity of wool which has been treated with a warm alcoholic sulphuric acid solution for basic dyestuffs. The effect is most marked and very permanent. Cold treatment with aqueous or alcoholic sulphuric acid, followed by washing with cold water, diminishes the affinity for acid dyestuffs, from which Gelmo and Suida believe that the acid fixed by this cold treatment is fixed in a somewhat different manner than when the wool is heated with the solution. No definite conclusions could be drawn with respect to the behavior of this wool toward the basic dyestuffs. It should be noted that this result might be expected if the acid treatment was only sufficient to leave the wool near its isoelectric point—i. e., pH 4.7. Only on the more acidic side of this point would the wool's affinity for acid dyestuffs be increased, while on the basic side it would still have no affinity for acid dyes but would to some extent retain its affinity for the basic dyestuffs. Their results, therefore, do not indicate any difference in the manner in which the acid is fixed, but rather a difference in the degree of fixation. The affinity of the mordant dyestuffs, such as Alizarine Red S and Anthraquinone Blue WG, for wool was also increased by the hot acid treatment.

Gelmo and Suida also investigated the action of hydrochloric, acetic and tartaric acid on wool in the same manner as with sulphuric acid in the foregoing paragraphs, and found that hydrochloric acid acts in exactly the same manner as sulphuric acid, but that with acetic acid the method of treatment is quite important. If the acetic acid treated wool is well washed, the acid appears to be entirely removed and the dyeing is unaffected. Only when the acetic acid is added directly to the dye bath does it retard the fixation of the basic dyes or assist the exhaustion of the acid dyestuffs. The effect of tartaric acid is intermediate between that of acetic and the mineral acids.

Gillet, *Rev. gen. mat. col.*, May, 1899, page 157, shows that when this acid-wool compound is treated with alkalies, so as to remove the combined acid, the wool again has its normal dyeing properties. Gelmo and Suida, *Sitzungs Ber. Kaiserl. Akad. Wissenschaften,* May, 1905, confirm Gillet's result, but Fort and Lloyd, *J. Soc. Dyers and Colourists 30,* 75 (1914), state that the dye retarding effect remains even after washing and neutralizing the acid-treated stock with dilute soda or borax solution, and rinsing.

Fort and Lloyd, *loc. cit.,* believe that the resisting action of strong sulphuric acid on wool (Beck and Beil's patent) is due to the absence of free amino groups in the treated fiber. This conclusion is substantiated by the fact that the acid-treated wool forms no condensation product with potassium naphthoquinone sulphonate.

Lloyd, *J. Soc. Dyers and Colourists 28,* 337-340 (1912), gives Table XXXVII comparing the amounts of sulphuric acid absorbed by various keratin fibers under similar conditions at various concentrations. The percentage of acid as given in the table is based on the weight of the fiber present. This table is comparable with Table XLVI by the same author, giving the same data for acetic acid.

TABLE XXXVII

Absorption of Sulphuric Acid by Various Animal Fibers

Percentage of Acid Added	Percentage of Acid Absorbed				
	Cross-bred	Down Top	Alpaca	Mohair	English
5.0	3.29	3.48	3.74	3.69	3.44
5.5	3.67	3.96	3.96	3.92	3.84
6.0	3.94	4.12	4.36	4.41	4.18
6.5	4.36	4.58	4.69	4.72	4.49
7.0	4.72	5.13	5.10	5.13	4.88
7.5	5.01	5.03	5.36	5.34	5.31

Harrison, Wool Research Association, 1919, in reporting upon a series of experiments on the influence of sulphuric acid upon the tensile strength of wool, says that sulphuric acid up to 80 per cent strength has little effect at temperatures below 50 deg. Cent. (122 deg. Fahr.), and the effect of the time factor is not marked. On impregnating the fiber with strong acid, heat is evolved with subsequent tendering. Acid of 80 per cent strength or over, or temperatures above 50 deg. Cent., tender the fiber. When the wool is boiled with 10 per cent of sulphuric acid, on the weight of the fiber, which equals about a 0.33 per cent aqueous solution, tendering is first noticed. This checks fairly well with the work of Ristenpart and Petzold, which follows later. Wool may be warmed to 50 deg. Cent. with acid of 16.5 per cent strength, 500 times the weight of the yarn, for an hour without appreciable

tendering. As a rule, wool is liable to damage by sulphuric acid at all temperatures above 60 deg. Cent. (140 deg. Fahr.).

In a study of the carbonizing process W. Harrison, *J. Textile Inst. 9*, 10-13 (1918), found that the loss of strength in acid treated wool is much more pronounced when the wool is heated at 100 deg. Cent. (212 deg. Fahr.) while saturated with dilute sulphuric acid, than when it is rapidly dried below 77 deg. Cent. (170 deg. Fahr.), and then heated under the same conditions to the higher temperature. With an acid concentration of 50 grams of sulphuric acid per liter, little or no tendering occurs below 60 deg. Cent. (140 deg. Fahr.), and if the acidified wool is first dried, it may be heated for two hours at 100 deg. Cent. (212 deg. Fahr.) with very little tendering. With acid at 100 grams per liter, tendering is produced during drying and subsequent heating. When tendering has been caused by drying wool with the acid in it, the wool may regain strength after washing and neutralizing. This is due to a partial gelatinization of the wool fiber by the concentrated acid, and its subsequent coagulation when the acid is removed. In practice, goods should be neutralized as soon as possible after carbonizing.

Harrison states that in carbonizing wool, 100 pounds of air-dry wool containing 20 per cent of vegetable matter, on treatment with a 6.5 deg. Tw. (1.0325 Sp. Gr., or 4.86 per cent H_2SO_4), will take up about 10 gallons of acid solution or 5 pounds of pure sulphuric acid. Of course, these figures are not exact, for as we well know, the exact amount of acid taken up by the wool will vary with the hydrogen ion concentration of the solution, the temperature, and the amount of pressure used in squeezing the wool as it leaves the acid bath. Harrison says that just about 20 per cent of the acid absorbed, or one pound of acid, is removed from the wool with the removal of the vegetable matter, and that on rinsing the wool with 400 gallons of water, a further 2.4 pounds of acid will be removed, leaving 1.6 pounds of acid in the fiber. About 2 pounds of soda ash will be required to neutralize this.

Von Georgievics, "Chemical Technology of Textile Fiber," Salter translation, second edition (1920), page 65, says that if carbonized wool is left for several weeks without neutralizing the residual sulphuric acid, it will be found to have sustained considerable alteration, as shown by the abnormal loss in weight on boiling in water. Such wool also behaves in a peculiar manner when dyed, inasmuch as it will then readily absorb Methylene Green (a basic dye), for example, which is not the case with normal wool. On the other hand G. states that it has almost entirely lost its affinity for acid dyestuffs. He also mentions the production of crepe effects on wool, based on the shrinking effects of acids on wool. Zinc salts, thiocyanates, or bisulphites may be printed on wool in the same manner, and steamed, to give these crepe effects.

While cold concentrated sulphuric acid does not seriously disintegrate wool in a short time, it does have a very rapid destructive action upon the cellulose present, and this forms the basis of United States Patent No. 1,509,172, September 23, 1923, to S. A. Ogden on a process for carbonizing the vegetable fibers present in wool shoddy, etc. In this patent it is proposed to treat the wool containing cellulosic material in a sulphuric acid bath of 50 to 58 deg. Be. (1.530 to 1.672 Sp. Gr.; about 62 to 66 per cent H_2SO_4) at 50 to 70 deg. Cent. (122 to 158 deg. Fahr.); but preferably with the more dilute acid at the higher temperature. "Under these conditions a rapid passing of the materials through the bath, or immersion, effects an immediate disintegration of the cotton in a more or less colloidal state, which acts as a protective influence to the wool by temporarily coating the wool substance." The wool is then washed as quickly as possible in order to avoid any possibility of damage to the wool. It is stated that other acids may be used in place of the sulphuric acid by this process. It is claimed that when sufficient cellulose is present in the acid the wool is not penetrated by the reagent, which is held on the surface of the wool by the colloidal cellulosic material present.

This process of carbonization does not appear to have come into any wide commercial use at the present time, and aside from the fact that the rather concentrated acid at the temperature mentioned in the patent may alter the dyeing properties of the finished stock, the process appears to offer other difficulties to practical operation. Judging from Harrison's work, *loc. cit.*, we might expect the acid of this strength and temperature to have some action on the fiber, even during the short period of contact. The rapid and economical removal of the acid from the fiber presents another problem in the practical operation of the process, as well as the recovery of the diluted acid from the wash water, etc. On the whole, it is rather difficult to see just where the proposed process has many outstanding advantages over the older processes of carbonization.

Ogden, in British Patent No. 239,553, Maarch 10, 1924, proposes to bleach wool or similar materials by treatment with sulphuric acid of a strength of 60 per cent by volume at a temperature of 70 deg. Cent. (158 deg. Fahr.) for thirty seconds, or at 54 deg. Cent. (120 deg. Fahr.) for ninety seconds. Other bleaching agents may subsequently be applied.

In a paper upon "Turgoids," E. Justin-Mueller, *Kolloid-Z. 37*, 239-244 (1925), states that feebly acid solutions cause increasing swelling in wool, with rise of temperature. With water and hydrate-forming salts, such as sodium sulphate, there is an increase in swelling up to about 60 deg. Cent. (140 deg. Fahr.), and then a decrease to zero effect at the boiling point. Silk fiber shows an increased swelling, with rise of temperature in feebly

acid solutions and with water up to the boiling point. Moderately strong caustic solution swells wool to a much greater extent than either cellulose or silk.

Table XXXVIII was calculated by Speakman, *J. Soc. Dyers and Colourists 40,* 409-410 (1924), from the work of others, and shows the absorption of sulphuric acid by wool from solutions of various hydrogen ion concentrations.

TABLE XXXVIII

Amount of Sulphuric Acid Combined with Wool at Various Hydrogen Ion Concentrations, as Calculated by Speakman from the Work of Von Georgievics and Pollak

Hydrogen Ion Concentration (Normality)	C.C. Normal Sulphuric Acid Absorbed by 100 Gms. Wool
0.00043	18.17
0.0013	33.80
0.0072	58.6
0.0193	71.0
0.0408	91.0
0.084	118.8
0.126	142.2

—Speakman, J. Soc. Dyers and Colourists 40, 409 (1924).

TABLE XXXIX

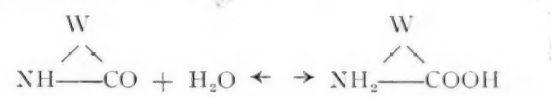
Amount of Sulphuric Acid Combined with Wool at Various Hydrogen Ion Concentrations, as Calculated by Speakman from the Work of Fort and Lloyd

Hydrogen Ion Concentration (Normality)	C.C. Normal Sulphuric Acid Absorbed by 100 Gms. Wool
0.0003	19.8
0.0010	38.8
0.0032	54.5
0.0040	73.0
0.0120	71.1
0.0158	78.9
0.0235	75.9
0.0289	77.7
0.0360	73.9
0.0410	77.4
0.0445	85.1
0.0506	83.0

—Speakman, J. Soc. Dyers and Colourists 40, 410 (1924).

High concentrations of sulphuric, hydrochloric, phosphoric, and even sulphurous acid, in the cold, develop a brown color on wool which disappears on dilution. According to Fort, *J. Soc. Dyers and Colourists, 32,* 187 (1915), the loss of sulphur dioxide from the wool during treatment with the first three of these acids must be regarded as incidental and unimportant in the production of the brown color, since something similar also occurs when an excess of sulphurous acid is used. On boiling wool with a mixture of 2 parts of sulphuric acid and 3 parts of water, the wool is completely hydrolyzed or dissolved. Most other mineral acids have the same effect, with the exception of nitric acid.

Fort and Lloyd, *J. Soc. Dyers and Colourists 30,* 76 (1914), believe that the acid or alkaline hydrolysis of wool develops free amino and carboxyl groups in the wool according to



and that the reverse of this reaction is obtained by the use of strong dehydrating reagents, such as sulphuric acid. This would explain the resisting action of strong sulphuric acid on wool.

Ristenpart and Petzold, *Leipziger Monatsch. Textilind 41,* 242-243 (1926), experimented upon the extensibility and tensile strength of woolen yarn after boiling for an hour in twenty times its weight of water and sulphuric acid in various concentrations. On the basis of these tests they believe that sulphuric acid, even in concentrations up to 9 per cent on the weight of the wool, has a protective action on the fiber, and that subsequent heating of the acid-treated wool up to 120 deg. Cent. does not cause a weakening of the fiber. Neither is it weakened by storage for as long as six months, with exclusion of light. When 9 per cent of acid has been used, the treated wool contains about 4.3 per cent of acid, and they claim that if this amount is not exceeded it is not necessary to use an acid weaker than sulphuric in dyeing.

Wilson and Kern, Philadelphia meeting of the American Chemical Society, 1926, have shown that, contrary to the usual expectations, vegetable-tanned calf leather containing 5 per cent of sulphuric acid is considerably more deteriorated in an atmosphere containing 100 per cent relative humidity than at 50 per cent relative humidity.

Hydrosulphuric Acid

G. Spagnol, *Biochim. terap. sper. 13,* 24-26 (1926), reports that wool which has been in contact with hydrogen sulphide gas for from fifteen minutes to three hours, and then exposed to the air for fifteen to thirty minutes, gives a dark yellow color with lead solution and the hydrogen sulphide was still detectable after 2,160 hours. The action of the sulphides will be considered later under the salts, as well as in a separate paper upon wool pulling.

Hydrochloric Acid

Bowman, "The Structure of the Wool Fiber" (1885), page 198, says that strong hydrochloric acid on wool produces the same blue or violet color which is characteristic of all the albuminous substances when treated with this acid. When the action is accelerated by heat the wool gradually dissolves. Very strong hydrochloric acid will dissolve the fiber even in the cold. Dry hydrochloric acid gas carbonizes the wool fiber and completely disintegrates it when the action is long continued. It should be noted, however, that at the present time hydrochloric acid gas is used in carbonizing shoddy materials under suitably controlled conditions.

Knecht, with Furstenhagen and Appleyard, *J. Soc.*

Dyers and Colourists 4, 104-6 (1888), found that on boiling 5 grams of wool in 500 c.c. of water containing various amounts of hydrochloric acid for an hour, the acid was absorbed as in Table XL:

TABLE XL

Absorption of Hydrochloric Acid by Wool

Percentage of Acid (On weight of wool)	Acid Left in Solution	Acid Absorbed	Indicator
7.94	4.84%	3.10%	Phenolphthalein
15.88	6.75	9.13	Phenolphthalein
23.81	11.97	11.85	Phenolphthalein

On boiling wool with 7.94 per cent of hydrochloric acid, as given under sulphuric acid, and extracting with successive boilings in distilled water, the results given in Table XLI were obtained:

TABLE XLI

Hydrochloric Acid Removed on Boiling Above Wool

	By KOH and Phenolphthalein	By $AGNO_3$
Amount of free acid left in solution	4.83%	5.00%
First boiling out	1.29	1.36
Second boiling out	0.55	0.67
Third boiling out	0.37	0.38
Fourth boiling out	0.12	0.18
Fifth boiling out	0.06	0.17
Sixth boiling out	Neutral	0.02
Total acid boiled out	2.39%	2.78%
Original amount of acid used	7.94	7.94
Acid left in solution and boiled out	7.22	7.78
Permanently absorbed or neutralized	0.72%	0.16%

Von Georgievics, *loc. cit.*, states that hydrochloric acid is not absorbed by wool to the same extent as sulphuric acid and claims that while wool mordanted with sulphates always contains sulphuric acid, wool mordanted with tin salt contains little or no hydrochloric acid.

Matthews, "Textile Fibers" (1924), page 147, says that hydrochloric acid acts in much the same manner on wool as sulphuric acid although the amount permanently absorbed by the fiber is quite small, most of the acid being removed by boiling water.

Tables XLII and XLIII by Speakman, *J. Soc. Dyers and Colourists 40*, 409-10 (1924), are of particular interest in that they show the amount of hydrochloric acid which combines with wool at various hydrogen ion concentrations. These show that the amount of hydrochloric acid in combination with wool is entirely dependent upon the hydrogen ion concentration of the bath. Reference to Figs. II and III* show that while a smaller percentage of hydrochloric acid than of the polyvalent acids is combined with the wool, the amount of each acid combined is in exact proportion to its ionization under identical conditions:

*See American Dyestuff Reporter of November 15, 1926.

TABLE XLII

Amount of Hydrochloric Acid Combined with Wool at Various Hydrogen Ion Concentrations, as Calculated by Speakman from the Work of Von Georgievics and Pollak

Hydrogen Ion Concentration (Normality)	C.C. Normal Hydrochloric Acid Absorbed by 100 Gms. Wool
0.0020	16.9
0.0047	30.6
0.0164	53.6
0.0396	65.2
0.0874	74.8
0.179	87.5
0.270	95.0

—Speakman, J. Soc. Dyers and Colourists 40, 409 (1924).

TABLE XLIII

Amount of Hydrochloric Acid Combined with Wool at Various Hydrogen Ion Concentrations, as Calculated by Speakman from the Work of Fort and Lloyd

Hydrogen Ion Concentration (Normality)	C.C. Normal Hydrochloric Acid Absorbed by 100 Gms. Wool
0.0003	26.8
0.0006	41.3
0.0140	54.1
0.0221	63.4
0.0359	61.7
0.0465	66.0
0.0585	67.7
0.0679	74.3
0.0840	65.9
0.0939	71.0

—Speakman, J. Soc. Dyers and Colourists 40, 410 (1924).

Upon soaking woolen fabric in cold concentrated hydrochloric acid, Trotman, Trotman and Sutton, *J. Soc. Chem. Ind. 45*, T20-4 (1926)†, could not detect hydrogen sulphide, but protein passed gradually into solution and was precipitated upon neutralization. This reagent appeared to attack the cortex particularly, and after 48 hours' treatment the epithelial scales were intact although the fabric was thin and tender. When treated with hot hydrochloric acid, a sparingly soluble residue is obtained, which is readily soluble in alkalies. It is peculiar that the action of hot and cold hydrochloric acid on wool appears to be different. The cold acid appears to attack the Protein B, or cortex of the fiber, while with hot acid the Protein A, or epithelium, appears to be the one dissolved. Also see Merrill, under alkalies on wool.

†See American Dyestuff Reporter 15, 470-471 (1926).

(Part II of this paper, which is the eleventh in the series on "Wool" by Charles E. Mullin, will appear in an early issue. It will deal further with the specific action of various acids on wool.)

Roth & Greer, Inc., Royersford, Pa., bleachers and dyers of textile fabrics, have been placed in the hands of Harry W. Maloy as receiver, by order of the U. S. District Court. It was stated the corporation was threatened with drastic action by the State for alleged pollution of Mingo Creek adjacent to the plant.

Fastusol Dyestuffs on Viscose and Cuprammonium Silk

Advantages of Direct Colors on Viscose—Fastness Properties Considered—The Dyeing of Unions Containing Rayon

PRIOR to the war there were, practically speaking, only three different kinds of artificial silk on the market: Nitrocellulose silk or Chardonnet silk (so called after its inventor); Cuprammonium silk (generally known as Bemberg, Eagle or Holken silk), and Viscose. A fourth kind made its appearance more recently, viz.: acetate silk.

The difference between these various qualities of artificial silk is due to their method of production. But whereas the other kinds are dyed, on the whole, by much the same method as cotton, acetate silk has only very little affinity or none at all for the great majority of ordinary dyestuffs; for the dyeing of acetate silk, Cellit fast dyestuffs, Celliton or Celliton fast dyestuffs and Cellitazol dyestuffs are preferably used.

Nitro silk, in contradistinction to cuprammonium silk and viscose, has a strong affinity for basic dyestuffs, and, therefore, as a rule, does not require to be mordanted previous to dyeing. On the other hand, this silk takes up direct dyestuffs less readily than cuprammonium silk and viscose.

Of the various kinds of rayon the last mentioned two fibers resemble each other most in respect of dyeing properties.

Rayon is largely used to-day in the textile industry for trimmings, braids, borders, laces, fringes, ribbons and similar articles used for ladies' dress goods. Plaited and knitted goods such as shawls, ties, etc., are also made of rayon silk; likewise light summer dresses and blouses, satins, etc. Velvet and plush manufacturers use it, and very striking effects in half-silk lining, hangings, upholstery cloths, curtains and wall coverings are produced with it. Rayon yarns are also used to a large extent in hand and machine knitting and embroidery (for stockings, jumpers, etc.).

Advantages of Direct Colors

Direct cotton dyestuffs are used very largely for dyeing cuprammonium and viscose, diazo, sulphur, and, more recently, indanthrene dyestuffs are also used to an increasing extent. The very pronounced colloidal, swelled state of the rayon fiber is the reason why these dyestuffs go more readily on the fiber and penetrate better than is the case with cotton when the same percentages are used. The result, of course, is that direct dyeings on rayon, as a rule, possess better fastness to washing than cotton dyeings of equal depth. The fastness to light of such dye on rayon, too, is notably better. The simple method of working, however, is the chief reason why direct dyestuffs are so extensively employed in rayon dyeing.

A series of dyes of the best possible fastness to light, called the *Fastusol dyestuffs,* has recently been selected from the direct range. These dyestuffs may be used with advantage for the production of fast-to-light shades that are not required to satisfy the very comprehensive demands which are placed on indanthrene dyeings and, at the same time, are distinguished by a simple method of working.

Light shades on hanks or pieces of viscose or cuprammonium silk are dyed with Fastusol dyestuffs in about one-half hour at 30 to 40 deg. Cent. (85 to 150 deg. Fahr) in a 1:30 liquor, pale and medium shades in one-half to one-quarter hour (at 60 to 70 deg. Fahr.) in a 1:20-25 liquor. Glauber salt is best omitted with pale shades, only a little soda and Monopole soap being added to the bath. Medium and dark shades, in addition to soda and Monopole soap, require about 10 to 30 per cent Glauber saalt. The goods are entered, as a rule, at about 30 deg. Cent. (85 deg. Fahr), and the bath gently heated up to 60 to 70 deg. Cent. (120 to 140 deg. Fahr.). Full shades on viscose may also be produced with advantage by entering the goods at 80 to 90 deg. Cent. (175 to 195 deg. Fahr.), the effect being that the baths are exhausted better. This does not apply to cuprammonium silk, which has a somewhat better affinity for direct colors and is worked at lower temperatures and with less salt. The result is improved by levelling.

Fastness Properties

Dyeings produced with Fastusol dyestuffs on viscose and cuprammonium, in addition to good fastness to light, are generally distinguished by their good fastness to ironing and acid brightening. Up to now, direct violet shades, in particular, could only with difficulty be produced fast to ironing. Fastusol Red Violet BBL and Fastusol Violet BL, owing to their fastness to ironing and spotting, are therefore valuable representatives of the Fastusol series.

When dyeing mixed fabrics of cotton and viscose or cuprammonium, the difficulty will always be to obtain both fibers alike in shade and depth. Such goods are

mostly dyed in a long liquor, Glauber salt, soap, and a little soda being used for full shades, soap and soda preferably only for pale and medium shades. The temperature during the dyeing operation should not exceed 50 deg. Cent. (120 deg. Fahr.). The higher the temperature and the larger the addition of salt, the more strongly will the artificial silk be dyed. This, of course, must be avoided in order to get the fibers dyed alike. The following Fastusol brands, dyed at about 50 deg. Cent. (120 deg. Fahr.) with the necessary precaution, do not cover the artificial silk more strongly than the cotton:

Fastusol Yellow RT
Fastusol Orange G, 5G, 3R
Fastusol Scarlet B
Fastusol Pink BB, G
Fastusol Violet BB, 3B
Fastusol Red Violet BBL, B, R
Fastusol Blue BRR, 6G, G
Fastusol Brown R, 3R, G, BR, GR
Fastusol Gray R

Absolutely satisfactory results, particularly in pale shades, are obtained in this way.

Knitted goods, e. g., hosiery, are mostly dyed in the bark. Pale shades are produced with the assistance of soap only, medium and full shades with 5 to 10 per cent Glauber salt in addition. If the cotton in the raw material shows up differently from the artificial silk, it is necessary to give a bleaching previous to dyeing in order to obtain uniform shades.

Articles of wool and viscose or cuprammonium silk (e. g., jumpers and stockings) resemble unions of cotton and wool in their dyeing properties. The Fastusol dyestuffs may be used not only for dyeing artificial silk and cotton, but also for half-silk and silk. Mixtures of wool and viscose or cuprammonium are dyed either in one or in two baths. If, for instance, the wool has first been acid-dyed with fast-to-light wool dyestuffs, the artificial silk is subsequently covered in the same or in another shade with the corresponding Fastusol colors. To prevent soiling the wool, 2 to 3 per cent Katanol W is added to the dye bath.

Dyeing of Unions

The dyeing of viscose or cuprammonium in union or half-silk fabrics presents a little more difficulty. The animal fiber will in most cases first be dyed acid, the artificial silk and cotton then covered in a second bath.

Shades which are required to be fast to light are dyed with those Fastusols which, as mentioned above, do not produce on artificial silk a deeper shade than on cotton, when a certain working method is observed. In this case also the addition of Katanol W is urgently recommended for the production of clear shades on wool and silk.

Nowadays mixed fabrics are on the market which contain acetate silk together with rayon, cotton, half-wool, or even half-silk. If the dyeings to be produced on these materials are required to be fast to light, it is important to know whether or not the acetate silk is stained by the Fastusol brands. The following Fastusol dyestuffs leave the acetate silk white or tinge it only very slightly:

Fastusol Yellow R extra, RR, RT
Fastusol Orange 5G, G
Fastusol Scarlet B
Fastusol Red BB, 4B
Fastusol Pink BB, G
Fastusol Bordeaux 5B
Fastusol Rubine B, R
Fastusol Violet 3B, BB, BL
Fastusol Red Violet R, B
Fastusol Brown R
Fastusol Blue G, BR, BRR, 6G
Fastusol Gray G, R.

In this way it is possible, for instance, to produce fast to light plain or contrasting effects in a simple way on mixtures of acetate silk and viscose and cuprammonium. The acetate is dyed with the well-known Cellit Fast or Celliton and Celliton Fast colors, and the older kinds of rayon with the corresponding Fastusol dyestuffs. It may be mentioned in this connection that acetate silk dyestuffs and direct dyestuffs can also be dyed in one bath.

The simple method of dyeing, the very good fastness to light, and the ease with which they may be used in combinations, are special properties of the Fastusol dyestuffs, which make them particularly suitable for the dyeing of viscose and cuprammonium silk.

THE CALEDON COLORS

Notable progress in producing fast dyes has been made in Great Britain, particularly through the researches of Scottish Dyes, Ltd., of Grangemouth. Scottish Dyes, a company now controlled by the Imperial Chemical Industries, Ltd., the large English chemical trust, manufactures a range of vat colors known as the Caledon Colors. The company has just issued an interesting color card showing this series of vats on mercerized, bleached cotton yarn in self and mixed shades.

The card displays 34 different colors in 144 shades, the percentage being given for each. Two tables are also given, with the quantities of material for dyeing 100 pounds of yarn; the first is for dyeing in the open tub, the second for machines. In another table the Caledon Colors are classified according to fastness properties. It is worthy of mention that in the text of this Scotch color card Monel-metal is recommended where metal vats other than iron are used.

Vigoureux Printing of Textiles

By George Rice

THE vigoureux method of producing colorful effects in fabrics for apparel, upholstery, drapery and similar purposes has received an impetus in the textile industry lately and a description of it may be interesting. Sometimes a new process is introduced or an old one reconstructed for economic reasons, or to improve the character of the product, or to gain singularity, or for other purposes. The vigoureux process of impregnating wool, worsted, silk, cotton or other textile material with dyed colors is not exactly new in this or other countries, for it has been carried on intermittently for a long time.

But it was not popular until increased efficiency and improved machinery made it possible to produce colors, effects and mixtures which would meet with the approval of the trade. Just now vigoureux printed woolen and other fabrics are popular. A number of large Eastern mills are engaged in the manufacture of cloths for suitings, dress goods and drapes for automobiles and homes from vigoureux products.

The process tends to improve the character of a fine woolen blend by imparting a degree of softness, luster and levelness that cannot be secured in any other known way, although the time may come when the ingenuity of man will make it possible to obtain greater softness, luster and levelness through the agency of other processes and machinery and with precisely the same raw material.

The vigoureux process tends to give a tone of singularity to the finished cloth. The latter is made in both plain and fancies for wearing purposes, and is popular for Palm Beach and tropical suitings because of its novelty as much as anything else.

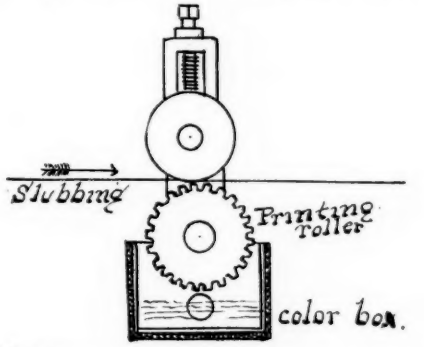
Ordinarily mixtures of textiles are made by blending two or more colors of different dyeings of wool or other

A double cross vigoureux print on worsted top before spinning.
Fig. 1.

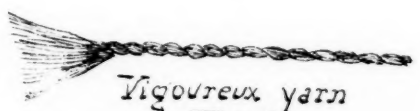
stock. The vigoureux process prints the desired colors for the blend in bands on the slubbing as the latter passes through the color-printing rollers of the machine. The slubbing is that part of wool which has been carded and partly prepared for spinning into yarn. The fibers have been arranged in order in a continuous direction, and refuse substances and short fibers (noils) have been cast out so that a slubbing of soft, fluffy wool results, devoid of any twist, but sufficiently intact to be run through printing rolls. We take wool as an example, although any of the textiles can be treated in the same way.

Putting the Color on the Slubbing

Instead of dyeing the slubbing as a whole, and then mixing two or more colors of slubbing together, the vigoureux method puts the two or more colors on the white slubbing in bands or in double crosses, and these slubbings make the mix in the later operations of drawing and mixing. By making a woolen or worsted this way a much finer and smoother-mixture-appearing effect is obtained. It simply illustrates what a difference in results is possible with precisely the same raw material when worked up along a special line. Of course, certain conditions have to be met. First, fine, straight, long and lustrous wool has to be used, and a mill may have to figure so close on a contract that no profit will be in sight if such wool is used. If coarse, kempy, dull and short wool is used, the fine smooth finish special to vigoureux products will be absent.



Vigoureux printing machine
Fig 2



Vigoureux yarn
Fig. 3

The process of putting the color on the slubbing is different from any ordinary process of printing. It is not like calico or wall-paper printing. A double-cross vigoureux printed slubbing as it appears when it leaves the printing machine is shown in Fig. 1. In some cases the colored bands which represent the color which has been impressed on the white slubbing extend straight across the surface instead of crosswise. A sectional view of the rolls of the printing machine is shown in Fig. 2. The printing roller is engraved or fluted according to the kind of colored bands it has to put on the white slubbing as the slubbing is drawn through in the direction of the arrow.

There may be only one roller or two or three, according to the number of colors intended to be impressed upon the slubbing. The fluted roller gets its supply of color from the color vat through the agency of the small roll, and the raised places on the surface of the former deposit the color on the slubbing. The necessary pressure to force the color into the fibers of the slubbing is obtained by the weight of the upper roller, which is forced down by a spring bearing on each shaft on which this roller turns.

Setting the Color

The dye materials used in the color box are necessarily high grade and of supposed fastness, for a manufacturer will not use cheap or inferior dyestuffs or chemicals on costly woolen material. There are imitation vigoureux products in which low-grade stock and unreliable dyes are used. But the manuufacturer of the genuine article is not going to take chances on color failure on virgin wool fabrics to save a little on dyes. The colors have to be set, however, whether they are of high or low grade. This is done in a steaming chamber in which the slubbing with its colored bands is subjected to saturation with moist steam.

A vigoureux mix always has a softer blend than is possible to obtain when making the mix with different colors of loose wool.

This is followed by a scouring to remove loose dyestuffs and foreign substances. A second exposure to steam at about 110 deg. Fahr. follows, and then the material is dried and run through the combing machinery, which mixes the colors while the process of combing out the short, curly, kempy and unsatisfactory fibers proceeds with the adjusting of the long, fine and satisfactory fibers in parallel order for spinning. A view of the spun vigoureux thread is shown in Fig. 3. The material is now ready for weaving or knitting in any type of textile fabric desired. Thus an even, fast, smooth and neat appearing color is procured which possesses certain advantages in looks over a color obtained in any other way, even if exactly the same textile stock and dyestuffs are used. All of which is a tribute to the ability of mankind to make something higher in commercial value by the simple application of artistry gained by experience with the materials he handles.

ARKWRIGHTS USE COLLEGE LABORATORY

The textile school of North Carolina State College has placed its research laboratories at the disposal of all candidates for admission into the Textile Arkwrights. The Arkwrights is a club organized by and composed of members of the Southern Textile Association; all of its members have completed some distinctive piece of research work on textiles.

The president of the Southern Textile Association, L. R. Gilbert, was among the first to take advantage of the school's laboratories and devoted two days to working up data for his Arkwrights thesis. He is a graduate of the State College Textile School and manager and treasurer of the Aubrey Spinning Mills. He believes that the action of his alma mater in offering its laboratory to prospective Arkwrights will materially aid the Southern Textile Association in performing important research work.

The modern equipment of the laboratories can be used for making yarns to be tested for breaking strength, elasticity and evenness under practical mill conditions. The tests will be made from cotton supplied by the mills of the State and by the experimental farm at State College.

The textile school at State College has recently been enlarged and the installation of equipment has been fully completed. The mills of the State of North Carolina are now at liberty to send their own men to the Textile School to carry out any tests they wish to make, and the laboratory will be turned over to them entirely. If aid is desired from the college textile faculty, it is freely and cheerfully given toward the advancement of the textile industry in North Carolina.

On Color Names: the Art of Word-Making

Question of Shades—Tendency Toward Systematizing Dyestuff Nomenclature—Significance of Brand Letters

By L. J. HOOLEY

THE number of dyestuffs has now become so large that if ten names were chosen at random and presented to an experienced colorist, it is doubtful whether he would be able to write down the chemical constitutions of more than two or three. At the same time, such has been the increase in the popular realization of their importance during the last few years, that if, instead of the choice being made at random, a few of the most familiar and representative were selected, there would probably be found few laymen unacquainted with at least two or three, and fewer chemists who could not remember having at some time heard of them all. As a fairly typical list of familiar names we might take Tyrian Purple, Indigo, Madder, Mauveine, Magenta, Eosin, Fluorescein, Aniline Yellow, Congo Red, Cachou de Laval, Indanthrene, Chlorophyll, and Acriflavine.

The number of commercial dyestuffs may be given as approximately ten thousand. This is roughly one-quarter of the number of words in a medium-sized dictionary and largely in excess of an average man's vocabulary. The art of conscious word-making as exemplified in dyestuff names is necessarily distinct from that of chemical nomenclature, for the names have to be acceptable to commerce rather than to science. Whether they should also be acceptable to letters is more debatable. They will often be also trade-marks, and part of the technique of making such is the avoidance of the banal. Further, the selective and modifying influence of time, which operates in the growth of common language, is here almost absent, so that a satisfactory name requires some sensitiveness on the part of its author.

Taking dyestuffs, so far as they are known at present, is there any evidence of uniformity or of general tendencies in the formation and selection of names?

The Question of Shades

To begin with, it is evident that there has been no attempt to define colors by differentiating them within fine limits of shade. The dyestuff maker is generally content to use a wide term such as blue or orange. Although this may at first seem a mistake, it is not so in reality, and to think so is to misunderstand the manufacturer's part in this question. If the dyer required the maker to give him an individual product for each of his mode shades, the onus of color definition might then be considered to lie with the maker. Such an arrangement, however, is quite unfeasible. We could as readily imagine that Turner had demanded from his colorman a separate pigment for every tint on his canvases. So long as the dye maker puts out a sufficient number of straightforward basic shades, the mixer can be left to do the rest, and from the special point of view of color composition, unnecessary elaboration of shade descriptions only causes confusion.

Leaving the question of shade and coming to that of chemical terms, it can soon be seen that, although a large number of chemical and quasi-chemical words are used, they are not employed either sufficiently generally or accurately to give the impression of being made a basis for dye classification. An exclusively chemical system has already been ruled out as inappropriate for products with a wide commercial use, and, although it might be the most desirable on formal scientific grounds, it would all the same be too complicated for the everyday use even of the chemist, while for others it could not be considered seriously. Imagine the varying pronunciations which dibromoindole and nitrosodimethylaniline would induce. The chemical names which have been incorporated into commercial dyestuffs use will be found to be employed too arbitrarily and to be too simple to be of much significance. Perhaps alizarine and anthracene have been used with more justice than others, although even here they will be found attached to compounds which have no connection with alizarine or anthracene, even if their fastness may approach that of derivatives of these substances.

The third possible framework for name-making is that of dyeing properties and purposes. This is used to about the same extent as the chemical one just dealt with, but much more rationally, for although the examples are very numerous, misuse is here rare. An "acid" color is found to be an acid color and not a direct. Theoretically and practically the method has fairly wide but still limited possibilities. For example, the number of color groups, divided according to use, are small, and when several hundred colors are named "acid" the term loses distinctiveness. "Acid" may be qualified by "acid milling" or "fast acid milling," but, carried too far, a definition is then felt to be taking the place of a name.

We can also examine the question from yet a fourth

aspect, that of the manufacturer. The making of the same product by different firms, of course, lends complication to the question and leads to the inconvenience of corresponding substances not being recognizable as such without reference to Schultz or the Colour Index. An individual name for each chemical individual was originally contemplated in the compilation of the Colour Index, but this project was not immediately practicable. The problem of the individual maker has been solved in a large number of cases by the adoption of a special name for each of his series. These names, which are generally trade-marks, show one of the most serious attempts which has been made towards the composition of trivial names. This practice is probably tending more than any other factor towards some partial standardization. Thus Caledon, apart from being indicative of national consciousness, means a vat dyestuff of the anthraquinone series manufactured by Scottish Dyes, Ltd., so that the one word simultaneously serves three different purposes, as well as later by reputation denoting a standard of fastness. Similarly Alizurol stands for an acid alizarine color of the British Alizarine Company, and the name implies, to those whose practice brings them into familiarity with it, all the known properties of the series it represents.

In these four main bases, color, chemical constitution, use, and manufacture, we have the principal considerations which have guided the making up of dyestuff names. Derived from these we have an enormous number of what may almost be regarded as roots. Many of these are common words, while probably a large number are partially artificial, being derived from English or other roots which may be roughly grouped as below, where a few examples of each are given.

Chemical: from benzene, toluene, naphthalene, anthracene, aniline, salicyl, gallic; amino, azo, carbo, chloro, oxo, hydro, thio, sulpho, nitro; phenyl, methyl, ethyl; alpha, beta, ortho, meta, para, peri, mono, di, tri, poly as in Alphanol, Acridine, Benzamine, Chlorazol and Dianil.

Colors: from chryso, cyanos, erythros, flavus, melas, niger, rhodo, ruber, as Chrysoidine, Nigrosine and Rhodamine.

Materials: from lana, erion, as in Lanacyl and Eriochrome.

Makers: from Ciba, Enbico, Erweco, Grela, Irga, Sando, Pon, Aliz, of which examples have already been given.

Places: from Alsace, Buffalo, Nippon, Chokosestsu.

Tendency Towards Systematization

It is not necessary to give examples other than the above of how these units are combined to give the various series names. In this process we can see a tendency towards some degree of systematization. Thus in some cases there is anology between corresponding series by different makers, e. g., Indanthrene, Alizanthrene, Duranthrene (which absorbed the earlier Chloranthrene), Sandothrene, Hydranthrene (since changed to Paradone), and finally Anthrene. Caledon does not fit into this scheme, as being the first anthraquinone vat series made outside Germany, it was established before the vogue for "-anthrene" came into being. One maker may be traced through several series as Duranthrene, Durindone, Durasol, and Duranol; or Ponsol, Pontachrome, Pontacyl, Pontamine, but perhaps excusably not Pontanthrene; or again Alizarine, Alizanthrene, Alizone, and Alizurol. Sometimes the series name does not appear until several members have been individually named and when perhaps the advantages of uniformity are appreciated better by the increasing difficulty of invention.

Thus Indanthrene once had for its fellows, Flavanthrene, Violanthrene, Cyananthrene, Fuscanthrene, Olivanthrene, Viridanthrene and Melanthrene, all of which are now in process of being forgotten, except Flavanthrene, which remains as the chemical name for the molecule it represents, and for which even Richter did not suggest a systematic name. The Indanthrene colors are now more than a hundred in number, and a brave imagination would have been needed to keep the original naming in line with the first eight, without losing the effect of spontaneity. The magic of Indanthrene has served not only to absorb its own congeners but to displace its Algol and Helindone rivals and thus to unite some two hundred or more different products. In this example the effect of cartelization of companies is evident, and is also suggestive for the future.

A Suggested Scheme of Nomenclature

In the cases discussed, the nucleus of a possible theoretical scheme can be seen. If for, say, the twenty most important color groups, twenty labels such as anthrene, anil, acyl, were chosen and to each of these an individual representative symbol as Pon., Dur., Aliz. added for the maker and if, further, an additional syllable be allowed for important divisions of each group or for different or special methods of application or use, then about sixty different words would give the possibility of eight thousand series names. Then, for the individual colors of a series, about twenty or thirty definite shades could be decided upon as yellow, orange, red, purple, violet, blue, green, brown, gray and black, with combinations such as orange-red and blue-gray, as well as clearly understandable variations such as gold-orange, olive, maroon, etc., so that about thirty or forty of the commonest and most distinct shades would have an unambiguous description. For special purposes, qualifications such as brilliant, light, dark, fast could also be allowed. Finally with

the provision of a number and not more than three letters for a brand, which would also be arranged according to a definite plan, there would be the framework of a system based on about a hundred words, the letters of the alphabet, and the ten digits, which with its capability of forming combinations amounting to millions, should have sufficient elasticity to provide for 90 per cent of colors. Under this arrangement names would be no longer than at present, each color would be self-explanatory as to maker, series, and principal use, while with the omission of the manufacturer's syllable, which would be uniformly put first, a color could be specified as an individual chemical substance independent of its maker.

The recognition of the possibilities of some such plan as the above would be of direct practical advantage when new colors or series come up for consideration. It could act as a curb on unnecessary versatility and there need be no fear of it exercising a deadening influence if worked with a will to the contrary. Significant syllables could be chosen so as to be as distinct as possible from each other and also so that they could be varied to fit in phonetically with contiguous syllables without losing their identity. The infinite variety of artificial words can be seen in cable codes, and the number of units required for a dyestuff system is so small in comparison, that there could be no difficulty in making up words which would satisfy any conditions required of them, aesthetic or utilitarian.

Any considerable alteration in existing names is quite undesirable, for name changing on any scale is always an awkward reform. This difficulty of alteration, however, forms an added reason for doing the best possible with a new name.

Returning, however, from the imaginary to the actual, one of the most distinct features of dyestuff names consists in the additional letters following the name and indicating special marks or brands. While appearing on first acquaintance as an additional vexation, it is sufficient to say in their defense that their use reduces the number of names proper by at least one-half, and while they can often be neglected where only a general acquaintance with a color is necessary, they are of the highest importance to the user for whom they are principally intended. To the dyer in each particular line they often represent differences which he regards for specialized purposes as almost fundamental.

Significance of Brand Letters

Sometimes these brand letters pique the curiosity because their meanings are unknown. As they are only occasionally explained by their authors these must usually be found by guessing, and they are then redolent of secrecy. Most commonly they mark a modification in shade which is too slight to justify fuller expression, as in the very frequent R, red, B, blue, G, yellow (gelb). Degrees of redness in a blue are indicated by an increasing number of R's. These are sometimes large enough to run into two figures, although judicious use should be satisfied by three or at most four repetitions of the same letter. Letters may, however, stand for anything besides shades. There is the P in potting brands of the Diamond Blacks, RRZ (Zuker) for the extra red shade of Indanthrene used in whitening sugar, and SE (Salzecht) for the brands of Saphirole which do not show salt spotting, and examples could easily be multiplied. One of the most useful markings is the K (Kalt) adopted by the I. G. to distinguish their cold dyeing vat colors.

In lettering there is stronger ground than elsewhere for demanding uniformity, and when there is already an established brand on the market, further manufacturers taking up the same product should not haphazardly adopt a different lettering.

Among the earth and mineral pigment colors, brand letters after names are rare. Instead we find ferric oxide under the names Berlin Red, Chinese Red, English Red, Indian Red, Prussian Red, and Venetian Red, the reasons for the variations being easily apparent. It is, indeed, this class of color which we find richest in distinctive names, perhaps the outcome of more leisured times when colors were brought over the seven seas, and the chemist was also mineralogist and metallurgist. The personal note is found oftener, and a new green brought immortality. Horace Vernet has had even his Christian name brought down to posterity.

One of the happiest examples of individual titles among the coal tar colors is afforded by the acid alizarines brought out by the Bayer Company and including Saphirole, Irisole, Astrole, Rubinole, Emeraldole, Celestole, Geranole, and Ursol. Here their number is insufficient to cause confusion, the colors merit distinctive names, and their disappearance could only be regretted.

Finally, if it be thought that the systematic has been advocated at the expense of the attractive and the picturesque it may be remembered that among hundreds of plain yellows, blues and reds we still have Amaranth, Cardinal, Carmine, Cerise, Coralline, Cyclamen, Dahlia, Garnet, Glaucine, Grenadine, Heliotrope, Iris, Jasmine, Mimosa, Opaline, Phloxine, Sepia, and Ultramarine, and we can be grateful for Guernsey Blue, Sky Blue, Glacier Blue, Delphine Blue, Foxglove Blue and Solway Blue, Earth Brown and Chestnut Brown, Jet Black and Corvan Black, Snow White, Mars Red and Kings Yellow.—The Chemical Age.

Rainbow Dyeing Co., Inc., Paterson, N. J., recently reported organized with capital of $100,000, has started operations. Diedrich Hartgens, 907 E. Twenty-third Street, Paterson, is president and treasurer.

Dyes Imported Through New York and Other Ports During July

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

IG—Interessen-Gemeinschaft der Farbenindustrie.
A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
Seig.—G. Seigle Corporation, Stuttgart.
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887.

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

FOREIGN dyes imported through New York and other ports of the United States during the month of July totaled 263,162 pounds, with an invoice value of $214,853. The imports by ports were as follows: New York, 257,992 pounds, valued at $209,489; Boston, 3,260 pounds, valued at $3,800; Albany, 1,800 pounds, valued at $1,311; Chicago, 110 pounds, valued at $253. Detailed imports are published below:

Imports of Synthetic Dyes

	Pounds	Invoice Value
1927—		
January	196,620	$186,387
February	312,277	262,364
March	404,714	352,414
April	402,783	323,732
May	349,476	265,752
June	318,450	253,054
July	263,162	214,853
Total (seven months)	2,247,482	$1,858,556
1926—		
January	300,441	$283,635
February	369,045	377,638
March	487,804	435,891
April	437,526	401,606
May	392,739	343,745
June	333,319	317,896
July	351,425	303,079
Total (seven months)	2,672,299	$2,463,490

Per Cent of Dyes by Country of Shipment

	July 1927	July 1926	Jan.-July 1927	Jan.-July 1926
Germany	63.5	60.0	56.27	50.14
Switzerland	22.0	30.0	25.74	35.29
France	2.0	2.7	3.42	3.67
England	2.0	1.8	4.21	4.18
Belgium	5.5	4.0	5.76	3.93
Canada	4.0	—	2.70	0.79
Italy	1.0	1.5	1.80	1.57
Netherlands	—	—	0.10	0.43

Five Leading Dyes, by Quantity, Imported During July

	Pounds
Vat Olive R (single strength)	9,153
Vat Brown R (single strength)	8,614
Alizarine, synthetic	8,376
Hansa Yellow G (single strength)	7,000
Helindone Printing Black RD Paste	6,000

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Dyes and Colors (pounds)	Intermediates (pounds)
December 31, 1926	360,488	562,536
January 31, 1927	615,542	647,692
February 28, 1927	896,059	719,055
March 31, 1927	869,963	712,617
April 30, 1927	1,125,983	827,260
May 31, 1927	1,065,143	813,137
June 30, 1927	1,003,847	866,105

Imports of Aromatic Chemicals

	Pounds	Invoice Value
January	6,298	$7,634
February	4,407	7,552
March	10,714	13,825
April	13,980	17,005
May	19,820	22,827
June	12,065	16,430
July	12,725	13,466

Imports of Color Lakes

	Pounds	Invoice Value
January	1,000	$731
February	....	....
March	4,868	3,241
April	2,011	1,674
May	1,631	1,194
June	4,888	1,982
July	400	....

The dyes in this report are grouped by both Colour Index and Schultz numbers, and, in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
16	137	Fast Yellow Extra—(IG)	10
44	56	Nitrosamine Red Paste—(IG)	500
70	—	Rapid Fast Red GL Paste—(IG)	4,000
104	—	Metachrome Olive Brown G Powder—(Bro.)	1,000
105	88	Acid Anthracene Brown R—(IG)	200
126	117	Erika 2GN—(IG)	25
127	118	Brilliant Geranine B—(By)	200
195	177	Alizarine Yellow GD—(S) Mordant Yellow GS—(IG)	1,572
196	175	Acid Ponceau E—(G)	110
224	193	Stanley Red—(CAC)	220
225	194	Thiazine Red RXX—(IG)	250
278	—	Chlorantine Fast Red 7BL—(I)	771
292	260	Eriochrome Verdone S—(G)	551
307	265	Acid Milling Black B—(G)	2,205
315	272	Brilliant Black BX—(IG)	77
316	273	Diaminogene Blue NA—(C)	1,321
319	—	Chlorazol Fast Helio 2RK—(BDC)	100
324	—	Diazo Brilliant Orange GR—(IG) Diazo Brilliant Scarlet ROA Extra—(IG)	757
325	—	Diamine Fast Violet FFBN—(IG)	250
326	279	Benzo Fast Orange WS—(IG)	100
349	—	Chlorantine Fast Yellow 4GL—(I)	1,323
357	300	Brilliant Carmine L Conc.—(IG)	200
368	306	Ignamine Orange 3G—(IG)	200
382	319	Chloramine Red 3B—(S) Diamine Scarlet 3B—(IG)	996
436	358	Acetopurpurine 8B Powder—(A)	510
441	—	Chromocitronine R—(DH)	882
448	363	Cotton Red 4BXA—(IG)	336
487	400	Acid Anthracene Red 3B—(IG) Acid Milling Red R Conc.—(G)	651
516	423	Chicago Blue B—(IG)	5
561	449	Trisulphon Brown B Conc.—(S)	3,000
597	—	Benzo Chrome Brown R—(IG)	144
632	18	Diphenyl Fast Yellow GL Supra—(G)	55
636	19	Fast Light Yellow 3G—(IG)	500
652	29	Omega Chrome Red B Conc.—(S)	500
653	—	Pyrazol Orange G Conc.—(S)	1,000
658	496	Rhoduline Blue 6G—(IG) Setoglaucine Conc.—(G)	851
667	503	Erioviridine B Supra—(G) Poseidon Green SGX—(IG)	1,542
670	505	Light Green SF Yellowish—(IG)	200
671	506	Erioglaucine X High Conc.—(G) Kiton Blue L—(I)	2,756
677	512	Magenta AB Powder—(IG)	1,000
680	515	Violet for Ink Pencils Extra—(IG)	600
681	516	Crystal Violet Extra—(IG)	600
682	518	Ethyl Violet—(IG)	1,500
691	523	Fast Green Extra Blue Shade Conc.—(IG)	2,925
692	524	Magenta S—(IG)	100
707	539	Opal Blue Bluish—(IG)	50
710	541	Direct Brilliant Blue 8B—(I)	220
712	543	Patent Blue V—(IG)	1,000
713	544	Cyanine B—(IG)	200
714	545	Patent Blue A—(Q) Poseidon Blue BR Conc.—(IG)	4,160
715	546	Blue Extra—(C) Blue FF—(C) Cyanol Extra—(C)	715
727	557	Chrome Violet—(G)	110
729	559	Basic Pure Blue BO Powder—(B) Victoria Pure Blue BO Powder—(IG)	1,051
733	562	Intensive Blue B Powder—(By)	110
735	564	Alkali Fast Green 3G—(IG) Erio Green B Supra—(G) Poseidon Green VGGX—(IG) Xylene Fast Green B Conc.—(S)	1,952
749	573	Rhodamine B Extra (s. s.)—(Q) Rhodamine B Extra (s. s.)—(IG)	5,250

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
768	587	Eosine Extra GFF—(IG)	50
786	—	Auracine G—(IG)	25
788	603	Rhoduline Orange NO—(IG)	400
789	—	Patent Phosphine G—(I)	331
793	606	Leather Yellow GC—(G) Phosphine O—(IG) Phosphine 3R—(IG)	1,520
797	608	Patent Phosphine GRNTN—(IG)	1,000
813	198	Mimosa Z Conc.—(G)	551
815	618	Basic Yellow T—(IG)	500
833	—	Wool Fast Blue GL—(IG)	1,126
873	681	Malta Gray J—(StD) New Fast Gray—(IG)	651
875	923	Nako 3GN—(IG)	25
879	—	Chromazurine G—(DH)	440
884	627	Chromacetine Blue S Extra—(DH) Modern Cyanine V—(DH)	496
892	635	Blue 1900 TCD—(DH)	110
894	637	Gallamine Blue Extra Paste—(G)	4,993
913	653	Danubia Blue BX—(IG)	250
926	661	Thionine Blue GO—(IG)	100
927	663	New Methylene Blue N—(IG) New Methylene Blue NS Conc.—(S)	2,000
969	748	Hydron Blue R Paste—(IG)	500
1005	746	Pyrogene Green 3G—(I)	661
1027	778	Alizarine Paste—Bluish—(I) Alizarine VI Extra Pure Paste—(IG)	8,376
1033	779	Alizarine Orange A Paste—(IG)	1,309
1034	780	Alizarine Carmine—(Q) Alizarine Red SW—(S) Alizarine Red SZ—(S) Alizarine Red S—(Q)	745
1039	785	Alizarine Red XGD Paste—(IG)	442
1045	787	Alizarine Bordeaux BP Paste—(By)	399
1060	801	Anthracene Blue SWG Powder—(IG) Anthracene Blue SWGG Powder—(IG)	600
1064	—	Alizarine Cyclamine R Paste—(IG)	1,985
1067	804	Alizarine Blue S Powder—(IG)	1,000
1077	860	Alizarine Direct Blue BGAOO—(IG)	500
1078	865	Alizarine Cyanine Green 3G—(IG)	200
1080	853	Special Violet B—(IG)	250
1084	854	Alizarine Viridine FF Paste—(IG)	1,819
1085	862	Alizarine Blue Black B Powder—(IG)	500
1088	855	Alizarine Sky Blue B Powder—(By) Alizarine Sky Blue B Powder—(IG)	1,550
1092	—	Alizarine Geranol B Powder—(IG)	500
1095	759	Anthra Yellow GC Paste—(IG) Anthra Yellow GC Powder (s. s.)—(IG) Anthra Yellow GC Powder (s. s.)—(B)	2,997
1096	760	Cibanone Golden Orange G Powder—(I) Vat Golden Orange G Pdr. (s. s.)—(IG)	220 800
1099	763	Vat Dark Blue BOA Paste—(IG)	1,434
1105	838	Vat Blue RS Dbl. Paste Fine (s. s.)—(IG)	400
1109	840	Vat Blue 3G Powder (s. s.)—(IG)	1,000
1114	—	Vat Blue BCSO Powder (s. s.)—(IG)	500
1115	843	Cibanone Blue G Powder—(I)	441
1118	849	Vat Yellow G Dbl. Pst. Fine (s. s.)—(IG)	1,962
1120	867	Anthra Brown B Paste—(IG)	500
1129	815	Algol Scarlet G Powder (s. s.)—(IG)	80
1136	822	Vat Orange RRK Paste—(By)	397
1143	827	Anthra Bordeaux R Paste—(IG)	976
1145	834	Vat Gray K Paste—(IG)	100
1150	833	Grelanone Olive B Powder (s. s.)—(GrE) Vat Olive R Paste—(IG) Vat Olive R Powder (s. s.)—(IG)	9,153
1151	—	Grelanone Brown RR Paste—(GrE) Grelanone Brown RR Powder (s. s.)—(GrE) Vat Brown R Paste—(IG) Vat Brown R Powder (s. s.)—(IG)	8,614
1152	—	Vat Brown B Paste—(GrE) Vat Brown G Paste—(IG)	1,588
1162	831	Vat Red RKP Powder—(IG)	200
1163	832	Vat Violet BN Paste Fine—(B)	962
1169	792	Cibanone Orange R Powder (s. s.)—(I)	1,760
1178	876	Indigosol O—(IG)	100
1184	881	Brilliant Indigo 4B Paste Fine—(IG)	5,148
1188	884	Brilliant Indigo BB Paste—(IG)	1,021
1190	885	Brilliant Indigo B Paste—(IG)	2,294
1213	921	Vat Gray 5B Powder (s. s.)—(IG)	135
1217	913	Helindone Orange R Paste—(IG)	1,000
1218	915	Vat Scarlet R Paste—(IG)	1,000
1227	904	Helindone Brown G Paste—(IG) Helindone Brown G Powder (s. s.)—(IG)	1,350

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Violet 7BN—(IG)	1
Alkali Fast Green 2BF—(By)	100
Alkali Fast Green 10G—(IG)	200
Brilliant Acid Blue FF—(By)	308
Brilliant Milling Blue B—(C) Brilliant Milling Blue B—(IG)	2,200
Brilliant Wool Blue FFB Extra—(IG) Brilliant Wool Blue FFR Extra—(IG) Brilliant Wool Blue FFR Extra—(By)	5,572
Bromofluoresceine Extra A Powder—(M)	425
Cloth Fast Brown 5R—(I)	771
Cloth Fast Red 3B—(I)	331
Fast Acid Green BB Extra—(IG)	300
Guinea Fast Green B—(IG)	600
Guinea Fast Red 2R—(IG)	250
Indocyanine B—(IG)	500
Ink Blue BITBN—(IG)	1,500
Lanasol Orange 2R—(I)	662
Metanil Red 3B Extra—(IG)	200
Milling Orange G—(IG)	200
Milling Red 6BA—(IG)	200
Neolan Orange G—(I)	110
Neolan Verdon B—(I)	220
Neolan Violet R—(I)	220
Novazol Blue B—(G)	1,102
Onis 3B—(IG)	500
Pilatus Fast Blue GG—(IG)	500
Pilatus Fast Green BL Conc.—(IG)	300
Polar Brilliant Red B Conc.—(G)	441
Polar Orange GS Conc.—(G)	110
Polar Red 3B Conc.—(G)	220
Selan Printing Brown 3R—(IG)	300
Silk Yellow R—(IG)	250
Sulphon Orange G—(IG)	400
Sulphon Yellow 5G—(IG)	300
Supramine Black BR—(IG)	450
Supramine Blue FB, R—(IG)	200
Supramine Bordeaux B—(IG)	300
Supramine Brown G, R—(IG)	200
Supramine Red B—(IG)	200
Supramine Red 3B—(IG)	300
Supramine Red 2G—(IG)	200

Name of Dye and Manufacturer	Quantity (pounds)
Supramine Yellow R—(IG)	200
Wool Fast Yellow 5G—(By)	511
Xylene Fast Blue FF Conc.—(S)	1,000

Vat Dyes

Algol Blue 3RP Powder—(IG)	400
Alizarine Indigo 5R Paste—(IG)	400
Anthra Orange RH Paste Fine—(IG)	
Anthra Orange RH Double Paste Fine (s. s.)—(IG)	900
Anthra Pink R Extra Paste Fine—(IG)	1,000
Ciba Brown G Paste—(I)	1,680
Ciba Pink BG Paste—(I)	2,205
Cibanone Bordeaux B Powder (s. s.)—(I)	550
Eridan Brilliant Scarlet B Paste—(IG)	200
Grelanone Red 2B Powder (s. s.)—(IG)	400
Helindone Fast Scarlet G Paste—(IG)	500
Helindone Printing Black RD Paste—(IG)	6,000
Helindone Yellow IFFRK Powder (s. s.)—(IG)	400
Hydron Brown R Paste—(C)	330
Hydron Olive GN Paste—(IG)	500
Hydron Violet RF Paste Highly Conc.—(IG)	500
Indigosol AZG—(DH)	110
Indigosol O4B—(DH)	440
Indigosol Black TB—(IG)	100
Indigosol Orange HR—(DH)	55
Indigosol Pink HR, IR—(DH)	165
Indigosol Violet AZB—(DH)	55
Indigosol Yellow HCG—(IG)	55
Vat Blue RZ Double Paste (s. s.)—(IG)	3,000
Vat Blue Green B Double Paste (s. s.)—(IG)	996
Vat Brown GG Powder (s. s.)—(IG)	2,500
Vat Golden Orange 3G Paste—(IG)	1,588
Vat Golden Yellow GK Double Paste Fine (s. s.)—(IG)	5,000
Vat Green G Double Paste (s. s.)—(IG)	2,998
Vat Green GG Powder (s. s.)—(IG)	800
Vat Khaki GG Paste—(IG)	500
Vat Orange 3R Paste Fine—(IG)	463
Vat Orange 4R Powder (s. s.)—(IG)	250
Vat Orange RRTS Powder (s. s.)—(IG)	500
Vat Printing Black BR Paste—(By)	441
Vat Red BK Paste Fine—(IG)	794
Vat Red 2G Paste—(B)	440
Vat Red Brown R Paste—(B)	
Vat Red Brown R Powder (s. s.)—(IG)	877
Vat Yellow 3RT Conc. Powder (s. s.)—(IG)	500

Mordant and Chrome Dyes

Acid Alizarine Gray G—(IG)	600
Acid Anthracene Red 5BL—(IG)	200
Acid Chrome Black RL—(IG)	1
Alizarine Fast Gray 2BL Powder—(IG)	500
Azo Alizarine Yellow RFS—(DH)	55
Azol Printing Red R Extra—(IG)	100
Chrome Printing Red Y—(DH)	220
Chromochlorine G—(DH)	55
Chromocyanoline D—(DH)	55
Chromoxane Pure Blue B—(IG)	500
Chromoxane Pure Blue BLD Powder—(IG)	100
Chromoxane Violet R—(IG)	2
Eriochrome Blue SE Supra—(G)	22
Eriochrome Geranol R Conc.—(G)	551
Eriochrome Phosphine RR—(G)	551
Metachrome Blue Black 2BX Powder—(A)	551
Oxychrome Brown V Powder—(IG)	220
Ultra Corinth B—(S)	500
Ultra Orange R—(S)	1,000

Direct Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Benzo Chrome Black Blue B—(IG)	100
Benzo Fast Black L—(IG)	500
Benzo Fast Blue 8GL—(IG)	1,075
Benzo Fast Blue 5R—(IG)	1
Benzo Fast Brown 3GL—(IG)	800
Benzo Fast Brown RL—(IG)	1,406
Benzo Fast Eosine BL—(IG)	50
Benzo Fast Gray BL—(By)	121
Benzo Fast Heliotrope 4BL—(By)	601
Benzo Fast Orange 2RL—(IG)	200
Benzo Fast Red 6BL—(IG)	
Benzo Fast Red 6BL—(By)	400
Benzo Fast Yellow RL—(IG)	1,100
Benzo Rhoduline Red B—(IG)	300
Benzo Rhoduline Red 3B—(IG)	600
Brilliant Benzo Fast Yellow GL—(IG)	300
Brilliant Benzo Violet 2BH—(By)	100
Chlorantine Fast Blue 4GL—(I)	441
Chlorantine Fast Bordeaux 2BL—(I)	1,543
Chlorantine Fast Brown 3RL—(I)	1,764
Chlorantine Fast Gray B—(I)	1,102
Chlorantine Fast Orange 2RL—(I)	441
Chlorantine Fast Violet RL—(I)	1,102
Chlorantine Fast Violet 2RL—(I)	551
Chlorazol Drab RH—(BDC)	200
Chlorazol Fast Orange AG—(BDC)	500
Diamine Azo Brown 3G—(C)	550
Diamine Azo Green 3G—(C)	550
Diamine Catechine 3G—(IG)	200
Diamine Fast Orange EG—(IG)	1,400
Diamine Fast Orange ER—(IG)	700
Diazo Black VG—(I)	551
Diazo Brilliant Green 3G—(By)	377
Diazo Brown 3RD—(By)	458
Diazo Fast Black SD—(IG)	200
Diazo Indigo Blue 4GL Extra—(IG)	500
Diazo Indigo Blue 2RL—(IG)	300
Diazo Pure Blue B—(By)	1,100
Diazo Rubine B—(IG)	400
Diazo Sky Blue 3GL—(IG)	300
Diazol Brilliant Orange NJN—(CN)	1,102
Diazol Light Red N8B—(CN)	441
Diphenyl Fast Bordeaux G Conc.—(G)	110
Fast Cotton Brown 4RL—(AG)	100
Fast Cotton Rubine B—(IG)	100
Minaxo Black BBNX—(IG)	100
Paper Red A Extra—(IG)	700
Para Green BBL—(IG)	5
Para Yellow R—(IG)	12
Paranil Bordeaux B—(IG)	5
Paranil Brown R—(IG)	5
Paranil Green B, G—(IG)	10
Rosanthrene Orange R—(I)	1,543
Rosanthrene Violet 5R—(I)	214
Toluylene Yellow G—(IG)	5
Zambesi Black D—(IG)	500
Zambesi Pure Blue 4BG—(AG)	100
Zambesi Rubine B—(IG)	5

Direct Dyes for Artificial Silk

Celliton Yellow 3G Paste—(IG)	100
Cibacete Navy Blue 3R Paste—(I)	220
Dispersol Yellow 3G Paste—(BDC)	105
Duranol Black Paste—(BDC)	1,000
Duranol Blue G Paste—(BDC)	760

Name of Dye and Manufacturer	Quantity (pounds)
Duranol Orange G Paste—(BDC)	162
Duranol Red G Paste—(BDC)	112
Setacyl Direct Blue G Powder—(G)	551
Setacyl Direct Pink 3B Conc.—(G)	22
Rapid Fast Dyes	
Rapid Fast Orange RG Paste—(IG)	2,500
Rapid Fast Red LB Paste—(IG)	200
Rapid Fast Red GZ Paste—(IG)	1,000
Basic Dyes	
Basic Black—(Q)	55
Brilliant Rhoduline Blue R—(IG)	200
Rhodamine 6GH Extra (s. s.)—(S)	2,500
Rhodamine 6GDN Extra (s. s.)—(IG)	3,450
Straw Blue G—(By)	100
Sulphur Dyes	
Indo Carbon SN—(IG)	1,000
Pyrogene Brown G—(I)	220
Pyrogene Cutch 2R Extra—(I)	220
Sulphite New Blue BL—(IG)	290
Thional Brilliant Green 6G Conc.—(S)	200

Color-Lake and Spirit-Soluble Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Alizarine Astrol Powder (Oil Soluble)—(IG)	200
Auramine Stearate—(Q)	20
Brillianton Orange R Powder—(IG)	150
Ceres Yellow VI—(IG)	20
Hansa Yellow G Paste—(IG)	
Hansa Yellow G Powder (s. s.)—(IG)	7,000
Hansa Yellow GSA Powder—(IG)	1,000
Hansa Yellow 3R Powder—(IG)	50
Helio Bordeaux BL Paste—(IG)	1,275
Helio Red RMT Extra Powder—(IG)	300
Stone Fast Scarlet G Powder—(IG)	100
Stone Rubine BN Powder—(IG)	500
Tero Black FB—(IG)	200
Tero Carmine FB—(IG)	50
Zapon Blue G Powder—(IG)	5
Unclassified Dyes	
Icyl Blue G—(BDC)	100
Grasol Blue R—(G)	11
Soluble Blue Green Shade I—(By)	100
Whitex Washing Blue—(Eze Mfg. Co.)	8,500

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XXXII

A Continuous Machine—Its Construction and Operation—Special Features of the Plant

By RAFFAELE SANSONE

IN some mills sulphur colors are dyed on a large scale in a few shades, and it is found convenient to perform this process in special plants. With one of these, shown in Fig. 1, the goods are treated several times with the same bath, while being exposed to an equal oxidation action throughout.

Here is to be seen a long, narrow vat V, of a suitable metallic composition to resist the action of the sodium sulphide baths. This is divided into seven compartments by five upper partitions which do not, however, reach the bottom, and are fixed to the upper rectangle X, which remains completely free from vat V. The first and last of the compartments are open, while the four central are covered. Rectangle X contains special supports for a long upper and lower series of binding rollers with side grooves for the entrance of cotton tapes, and is heated, in the case of the lower cylinders, by steam. To perform cleaning operations, vat V is lowered into a cellar or lower chamber H by disposition L, worked by hydraulic pressure, and at the end, towards the bottom, is a wide opening, the size of which is regulated by a special arrangement. This serves to discharge the different dye baths into a small cement trough J. The contents of trough J can be emptied, when necessary, into lower cement cisterns, serving for the different dyestuff solutions.

Rectangle X is joined at its ends to a light iron structure F, containing on one side an improved type of spreading arrangement N for the material M, coming up from a roll turning on lower supports, under such conditions that it is kept always with at the same tension. At the end of F is placed a prolongation D, with several guiding rollers leading to the rinsing vat T. This has the upper arms E with the plaiter P.

At the top of structure F is fitted a light iron platform, on which is placed, on a low wooden stool, a first half-tub B, for the dyestuff solutions, to serve for the dyeing, delivered by tap R into the second half-tub A, to be mixed there with water and brought to the best strength for delivery into vat V by tap S, or to be used without any addition, as may be most convenient. Both half-tubs are supplied with mixers, driven by separate motors, and with closed steam coils. The old bath making its way into trough J during the dyeing operations is pumped upwards continuously by tube I, centrifugal pump C and the long tube G, and makes its way to half-tub B to be reused after strengthening. The plant is driven by steam engine, gas engine or electric motor, at any speed which may be necessary for the class of goods treated.

Operation of the Plant

The operation of the above plant could be performed as follows: The end of the first piece of cotton cloth to be dyed is entered on the spreading device N before vat V, and joined to a pair of cotton tapes kept always at a certain distance from one another by the grooves in all the guide cylinders turning below rectangle X. These are passed through the whole plant, and make their way also in vat T and on folder P.

A strong bath is prepared in half-tub B with the sulphur colors to be employed for the dyeing operations, salt and soda, and by a special arrangement a fixed number of gallons of water is added in half-tub A, bringing it to 70 to 80 deg. Cent. by passing steam through the closed coil already indicated. When the above has been performed the strong dyestuff bath is added until reaching an inch from the upper edge. The whole of the diluted solution is then run into vat V, to fill to a certain height, and start it running into trough J through the overflow tube at the end, the opening of which is carefully regulated in accordance with the height to be given to the bath. When the first weak solution has been run into vat V, it is brought to the temperature required for the dyeing, and a second solution is prepared in half tub A. This, however, is caused to run slowly into vat V.

In the meanwhile, the plant is started, and the fabric passes slowly forwards, being colored more and more in the hot dye bath, which is kept always near the same temperature by regulating the quantity of steam circulating in the interior of the lower guide rollers. Pump C is started as soon as a certain quantity of old dye bath has collected in trough J, its action continuing until half-tub B has been filled to a certain height. At this point more salt, soda and dyestuff is added in half-tub B to keep its contents always at the same dyeing strength, and these are used for preparing the diluted solution in half-tub A whenever the latter has been consumed. On leaving vat V the dyed cloth passes upwards on D and enters trough T, where rinsing water is caused to run through very rapidly. Here all the sulphide of soda and mechanically fixed color is eliminated by the time plaiter P is reached.

When it is necessary to change the dye bath, a waste piece is run through the plant, reducing the speed of this as much as possible when the latter has entered entirely on the rollers of vat V. At this point all dye bath is run out of the vat, of trough J and of half-tubs A and B; vat V is lowered into H, cleaning it rapidly and again raising below rectangle X. In the meanwhile, half-tubs A and B and trough J have been rapidly cleaned, and the necessary dye bath has been prepared in the first two, performing the dyeing operations as indicated above.

Features of the Plant

The above plant possesses the following advantages:

1. The dye bath follows the cotton fabric as it continues its journey through vat V, repeating more or less the same action as would take place if the goods were dyed on the jigger by passing several times in the same bath; only that in this case exhaustion is performed less strongly.

2. The old baths are employed several times dur-

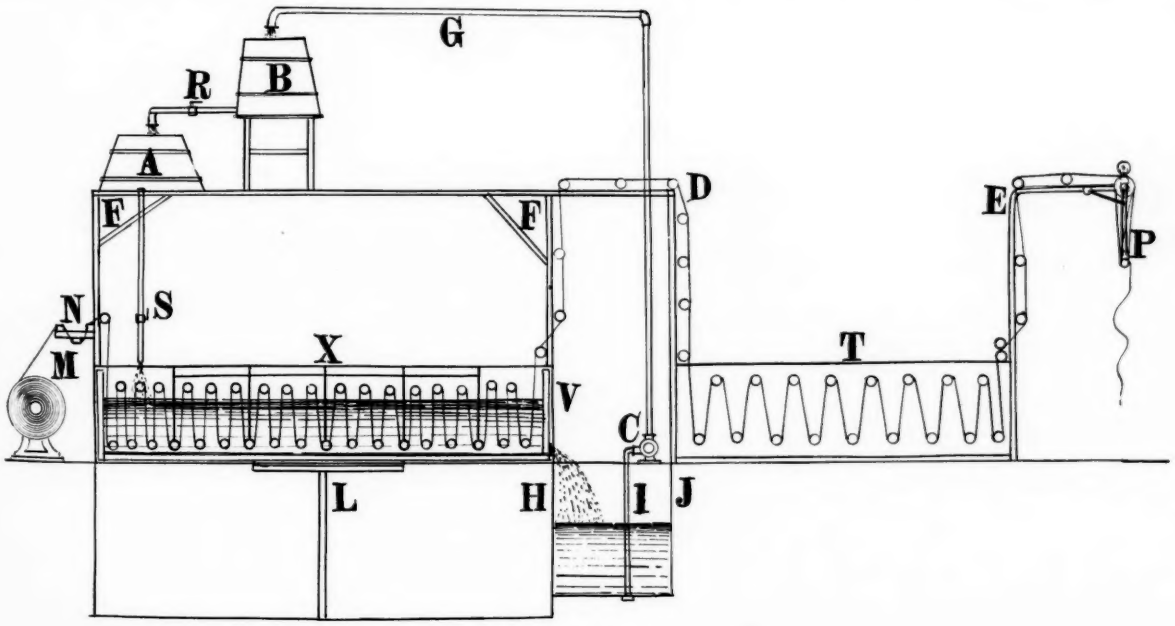


Fig. 1

ing the dyeing operations, and if everything is properly regulated the waste of dyestuff is greatly reduced.

3. When changing the dye baths, by applying the lower speed to the driving of the plant, this need not be stopped in any way, and if several operatives can assist in the cleaning operations and in the change of the baths, work can be conducted sufficiently rapid to arrange the entrance of the new lot of cotton cloth in the new dye bath without an excessive loss of time.

4. Only one dye vat is necessary, as the absence of binding rollers and steam coils in the latter renders the cleaning operations quite easy.

5. The oxidation of the color on the cotton is conducted during the dyeing always in the same way, and under conditions for reducing as much as possible the oxidation of the dye bath.

6. Through the covered condition of the four central compartments arranged in vat V, the loss of heat is much reduced.

Dyeing with Very Reduced Dye Baths

The great necessity of reducing to the lowest limits the quantity of dyestuff and sulphite of soda used in the dyeing operations will probably bring about in the future the use of plants in which the dye bath is used in as concentrated a condition as possible, and in just sufficient quantity to impregnate the cotton fabric. A plant constructed on this principle, in which successive dyeings are carried out, is shown in Fig. 2.

Here is to be seen a strong but light iron structure, so arranged that air can easily circulate in every direction. This contains six pairs of horizontally placed squeeze cylinders A, B, C, D, E, F, which form two long vertical rows, and are placed at a short distance from one another. Such cylinders are under the action of side-springs, regulated by screw-wheels.

At one of the sides of each pair of squeeze cylinders is arranged a double series of small binding rollers, through which the colored cloth passes back and forth

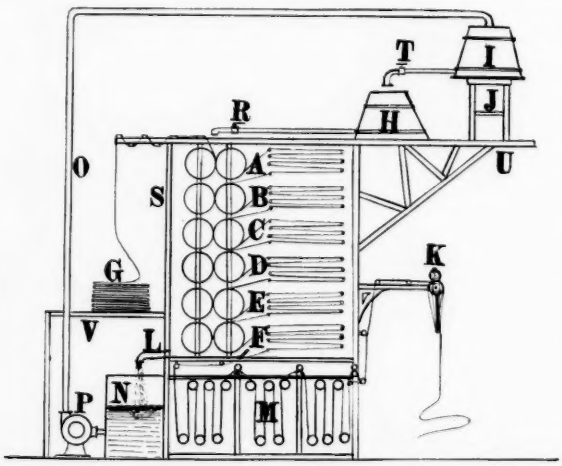


Fig. 2

in contact with the air before coming from one pair of cylinders to the other, and finally from the last cylinders to the rinsing trough M, where the material is treated with plenty of clean running-water, before delivering to plaiter K to be brought in piece form.

The top of structure S contains a good-sized platform, on which the operatives can mount through an iron stairs at the back of the plant. This contains, on the low wooden stool J, the half-tub I with tap T, for preparing the sulphide of soda and other solutions required during the dyeing operations. Half-tub H is for dissolving the sulphur colors and distributing their solutions. Both the half-tubs have a mechanical agitator and a closed coil for heating with steam. They are also supplied with a filtering arrangement. Half tub H is furnished with tap R, which delivers the strong filtered coloring solution to the nip of the uppermost pair of squeeze rollers, indicated by A.

From here the solution falls in the nip of rollers B to pass in close succession to the nips of the lower rollers C, D, E, and F. From the last of such nips the dye bath falls into a lower collection trough from which it passes out by tube L, to falling into the lower collection trough N, which is also heated through a closed steam coil. From here the old dye bath is pumped upwards to half-tub I by the assistance of pump P, and tube O.

To assist the operation of the plant the high table V is furnished, from which the cotton cloth pieces G to be dyed are entered into an upper spreading arrangement, from where they pass in a fully-spread condition into the nip of the uppermost squeeze rollers A, and from here in close succession on to the different series of rollers and between cylinders B, C, D, E, F.

Operation of the Plant

The above plant is worked as follows: After giving a rapid cleaning to rollers A, B, C, D, E, F, to the collection vat below these, to half-tub H, to half-tub I, and to trough N, the operatives enter a pair of strong cotton tapes, causing these to run through the whole plant and into grooves in the different series of rollers, which keep them always at a fixed distance apart; and, after the last of these, through the three compartments of vat M, where cold running water is run through rapidly.

After this, the operatives sew at the end of the cotton tapes the beginning of the first lot of pieces to be dyed, which is entered for the purpose on table V. They prepare in half-tub I the sodium sulphide solution to serve for preparing the first dyeing solution, which is then entered entirely into half-tub H. Here the necessary dyestuff is entered, the mechanical agitator being started to assure a thorough solution. In the meanwhile, a second solution of the sulphide of soda is prepared in half-tub I, and here the same quantity of dyestuff as used in half-tub H is introduced and brought into solution.

When both solutions have been prepared, as above, the plant is started, after opening tap R to bring the filtered

dyestuff solution gradually in the nip of squeeze rollers A, and from here to rollers B, C, D, E, F, and into collection trough N. As the solution in half-tub T lowers to three-quarters, tap T is opened to enter the second filtered dyestuff solution coming from half-tub I into half-tub H, and when in this way half-tub I has been emptied, tap T is closed and pump P started to bring the old dye bath from trough N into half-tub I. This is filled for four-fifths, after which pump P is stopped and the old bath in half-tub I is strengthened by an addition of sulphide of soda and of further dyestuff.

The third solution thus prepared is then utilized to fill half-tub H again, preparing in the same way a fourth, fifth and following solution of the dyestuff in half-tub I. As one lot of cotton cloth is nearing its end, it is sewn to the beginning of a new lot which is raised on table V, this operation continuing until there is material to be treated.

As the properly boiled-out cloth enters between the nip of squeeze cylinders A, it takes up a first lot of dye bath, which is pressed uniformly into it. When the material passes from here on the rollers, the sulphide of soda is oxidized, fixing the color. Between rollers B a second lot of strong coloring solution is absorbed, which is also fixed by oxidation; and as the cloth makes its way slowly down the plant, as many as four other coatings of color are fixed upon it, and it passes to rinsing vat M for elimination of all excess dyestuff, and the greater portion of the sulphide of soda still present in the material, so that this does not require much rinsing before being dried.

Special Features of the Plant

The plant possesses several marked advantages, some of which can be indicated as follows:

1. The fabrics come in contact between rollers A, B, C, D, E, F, with just what coloring liquid is necessary to wet them through uniformly.

2. The same solution is employed six times for dyeing each portion of the cotton fabric, so that its dyestuff is completely utilized.

3. After each wetting the cloth is exposed for a small interval of time in contact with the air of the chamber of treatment.

4. The old baths are used repeatedly, and if the quantity of liquid prepared is carefully regulated from the start, little is left after the dyeing.

5. The interior of squeeze rollers A, B, C, D, E, F, can be disposed to receive steam or hot air, and the treatment of the fabrics can be performed at any desired temperature up to 100 deg. Cent.

(To be continued in an early issue.)

IN NEW QUARTERS

On August 17 the United States Color & Chemical Company, Inc., moved its office, laboratory and warehouse to 140-144 Oliver Street, Boston. The telephone number will remain Hancock 5740.

SHIFTING OF WORLD DYESTUFF MARKETS

A comparison of the production figures indicates the effect upon German industry of the growth of foreign dyestuff industries. An examination of conditions in the world market strengthens the impression that the United States and Great Britain, who were before the war the best customers, Italy, France and Switzerland are now in a position to cover their own needs almost entirely and even to export a part of their output.

The extent to which German exports of dyes have dropped and the changes in precedence of the markets is shown in the following tables, supplied by the Department of Commerce, Bureau of Foreign and Domestic Commerce:

GERMAN COAL-TAR DYESTUFFS EXPORTS
1913 AND 1926

	1913		1926	
	Metric Tons	Marks	Metric Tons	Marks
Aniline dyestuffs, and other dyestuffs, n. e. s., sulphur dyestuffs	64,288	142,079	21,168	132,364
Alizarine Red	6,132	9,326	499	1,270
Other alizarine dyestuffs	4,907	12,247	2,502	22,130
Indigo	33,353	53,323	12,432	39,865
Indigo, carmine, color lacs, etc.	256	945	541	2,417
Total	108,936	217,920	37,142	198,046

THE MOST IMPORTANT BUYERS OF GERMAN DYESTUFFS

1913			1926		
	Marks	P. C.		Marks	P. C.
China	45,970,000	19.89	China	52,933,000	26.73
United States	41,210,000	17.84	Brit. India	27,272,000	13.77
Great Britain	29,420,000	12.74	Czecho-Slovakia	12,891,000	6.51
Austria-Hungary	17,390,000	7.53	Japan	12,474,000	6.30
Japan	14,860,000	6.43	Russia	11,755,000	5.94
Brit. India	13,340,000	5.77	Netherlands	8,442,000	4.26
Italy	12,160,000	5.26	Dutch India	7,482,000	3.78
Russia	11,020,000	4.77	United States	6,996,000	3.53
France	7,630,000	3.30	Great Britain	6,993,000	3.53

Average value of German mark, 1913, in United States currency, $0.2382. Average value of German mark, 1926, in United States currency, $0.238.

RAYON AND DYES NOW IMPORTANT ITALIAN PRODUCTS

No coal tar dyes were made in Italy before the war. Now the Italian synthetic dyestuff industry supplies fully 50 per cent of the domestic requirements, producing upwards of 4,900 metric tons of intermediates, and about 7,000 tons of dyes, the bulk of which are sulphur colors.

As a world producer of rayon Italy now holds second place, with a production last year of 17,000,000 kilos of rayon, as against only 1,000,000 kilos in 1914.

The Italian chemical industry, according to a report from Assistant Trade Commissioner E. Humes at Rome, employs from 130,000 to 140,000 workers and uses more than 250,000 horse-power.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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FOR SAFETY'S SAKE

HOW to organize for safety in a textile mill and what can be expected will be discussed at the session of the Textile Section of the National Safety Council which will be held during the sixteenth annual safety congress at Chicago, September 26-30. G. S. Bohlin, of Cheney Bros., will dwell on "Safety Practice in a Silk Mill" and D. Frank Lord, of the M. J. Whittall Associates, will discuss "Safety in a Carpet Mill." H. C. Washburn, of the Fisk Rubber Company, will tell about "New Developments in Safeguards for Textile Machinery," and other speakers will talk about safe practices in woolen and worsted and cordage mills. Both members and non-members of the council will be welcome to attend all sessions.

A safety code covering the operation of dyehouses was in course of preparation when the Textile Section of the Council met last year. Apparently this code had not been completed, for no reference has been made to it in recent bulletins issued by the Council. Our readers, we feel sure, are as anxious as we are to learn what these safety experts have agreed upon as the proper measures for safeguarding against accidents most likely to occur in the dyehouse.

ASSAILING THE ANTI-TRUST LAW

A GROUP of business men recently announced that an "Association for Business Co-operation" was being planned as the first move in a drive to modify the Sherman Anti-Trust Act. This is a project which would seem to be of special interest to the American dyestuff industry.

The Sherman law was passed nearly forty years ago, at a time when even the shadow of a trust was a terrible bogey to the American public and when any mention of "gouging" or "monopoly" threw Congressmen into frenzied rants against "big business." But of late years the sentiment against trusts has become perceptibly weaker. The wind has shifted and is now blowing in nearly the other direction. Pressed hard by foreign competition on one hand and domestic competition on the other, those who assailed trusts a few years ago are now storming against the anti-trust laws.

Our major industries have been well organized into powerful trusts, but being held within the law they seem to cause little worry to the public. Those industries that are not so organized are either too conscientious to meddle with the law or are watched too closely by the Government. They have valiantly faced the competition from the big interests in this country and from the cartels abroad, but they have played a losing game. At last they have decided to combine in a fight for an amendment of the anti-truust laws on the ground that we have outgrown them. Their charge is certainly not unreasonable in the light of what our large industrialists have been doing.

An officer of the National Association of Credit Men, C. C. Martin, has been prominent in this movement against anti-trust legislation. In a recent interview he pointed out that the control of production by huge consolidations has been held legal, while any co-operation among the smaller trade units toward control of output and prices is prevented unless these smaller interests choose to merge and sacrifice their identity. On the other hand, our Federal Transportation Act of 1920, Mr. Martin further observed, provides for consolidation of railroads and express companies, something looked upon with terror forty years ago. As the Journal of Commerce recently declared, "We have industrially organized on a large scale to-day in entire accordance with the law, and it would seem to be almost true to say that the only enterprise which is quite safe from the Sherman Anti-Trust Law is a well-organized trust."

The real irony of this situation is felt most acutely by the unorganized, highly competitive business groups, such as our dyestuff industry. They find themselves checkmated in every game they attempt to play against the foreign cartels.

Where American business has had a hand in the combinations formed in Europe, however, it has realized handsome returns on its investments. Our antiquated trust laws, fortunately, are not in effect beyond the three-mile limit. To quote Mr. Martin once more:

> We participate in the international combines covering rayon, explosives and paints. We have our part in international understandings covering manganese. The German dye trust has American connections; we are interested in the international dynamite trust; while the Swedish match trust has been financed in this country and its activities are directed from this part of the world. In aluminum, copper, packing products, zinc, electric lamps, petroleum products and many other combines we are a part, and a very important part, of international understandings.

But at home conditions are different. The Federal

Trade Commission keeps a wary eye open for any attempt among smaller business interests to control their production and prices for more economical operation. Even the dye industry has been accused on several occasions of creating a monopoly. But the world should know the truth. It is high time to tell how our dye manufacturers, estopped from any effective co-operation by the anti-trust laws, have had to sit by and watch Europe form one cartel after another, first in Germany, then in France, and finally in England. Against these steel-jacketed combinations we are now endeavoring to compete in the markets of the world, while we keep them from our own gates by a tariff that may be attacked any day from within.

Our dyestuff manufacturers should actively align themselves with the drive for modification of the Sherman act. The project is indeed a timely one, and in supporting it our dye industry will be moving a little nearer to the ideal of a healthy, well-organized co-operative enterprise.

STOLEN FORMULAS

THAT stolen chemical formulas often bring high prices is evident from the case of the three employees of the German dye trust who were caught in Hoechst last week in an attempt to carry certain manufacturing secrets to England in their socks. A contract said to have been found on the men fixed the purchase price of the formulas at something over $200,000. According to the press dispatches this contract promised air passage to England and steady employment with a share of the profits.

A nice, fresh chemical formula from Germany is apparently considered in some quarters to be worth a small fortune. But why, may we ask, must stolen formulas always come from Germany? We wonder how much an American formula in perfect condition would bring in the foreign market. We wonder, also, how one is able to know that one is buying an absolutely genuine *imported* formula.

As to the case of the men caught in Hoechst, it seems unusual that the "English interests" who contracted for the purchase of the secrets should have offered to employ those who stole them. It is not unlikely that the same men would have soon secured English formula in the same manner, proceeding to the United States, perhaps, to dispose of their booty.

As long as there are firms ready to buy secrets stolen from a business rival there will always be employees that steal them. But the act must be regarded as lower than mere thievery when the stolen property is carried into another country.

S. Slater & Sons, Webster, Mass., are contemplating the establishment of a bleacherry at Marietta, S. C., in addition to the new cotton mill at Marietta, for which a contract was recently awarded.

CORRECTION

Through an unfortunate error in making up the issue of July 25 the photograph on page 864, illustrating the article on "Piece Dye Kettles," by Raymond R. Stevens, was erroneously credited. This installation of boiling kettles in the dyehouse of the Felters Company should have been credited to the Rodney Hunt Machine Company, of Orange, Mass.

RECENT LITERATURE

Year Book of the National Association of Cotton Manufacturers

The Year Book of the National Association of Cotton Manufacturers, used by textile manufacturers throughout the world and regarded as one of the most authoritative and helpful sources of information on the industry, proves even more valuable in the tenth of the series now available. The 1927 edition is the most complete statistical manual that has been published by the association.

It presents in a concise, condensed form a summary of practically all of the reliable figures that would be of use to a cotton manufacturer. For those seeking specific information it is a guide through the huge quantities of data collected by many governmental departments in this country and abroad and by private concerns.

Much new material has been added throughout. In the statistical section the new tables include one giving the production, shipments, sales, stocks and orders of certain standard cloths by quarters for 1926. This is the first time that data of this sort have been available. In the technical section is given the construction of many of these standard fabrics.

Rayon's place in the industry is indicated by the statistics given on the production, exports, imports and consumption of rayon yarn in 1926. Other new material added to the statistical section includes the expansion of the table giving the range of staple of various cottons; mid-season stocks of all cotton in the world; number of active ring and mule spindles in the United States for selected years; quantity of the several kinds of raw cotton consumed and of stocks held in consuming establishments, and imports for consumption of countable cotton cloths.

Chemical method of identifying the different rayons is one of the many new features in the technical section, which has been radically revised since last year. The new material also includes a list of all of the Federal Specifications Board specifications for cotton materials; a list of the widths on which some of the standard fabrics are quoted; range of card settings; range of produc-

tion of roving frames, ring filling, warp and hosiery yarns; revised table for numbering roving; revised general specifications for testing textile materials published by the Federal Specifications Board, two new breaking strength tables giving the approximate strength of carded and combed yarns from different staples.

Primarily the book is for the use of members of the association, but can ordinarily be obtained by persons outside of the organization who have need for it. Both the president, William B. MacColl, and the secretary, Russell T. Fisher, point out that criticisms of the method of presenting the material or suggestions on data that might be included will add materially to the value of future editions.

An Index of Industrial Research

Industrial Research Laboratories of the United States, Including Consulting Research Laboratories. Bulletin of the National Research Council. Third edition, revised and enlarged. Compiled by Clarence J. West and Ervyl L. Risher. 153 pages.

Can anyone measure the research work being done by the industries of the United States? No; for to measure industrial research would be as impossible as to measure the results of that research. We face a difficulty from the start: what terms can we use to indicate the extent of the research undertaken? The total *cost* of industrial research might be estimated by a staff of diligent statisticians, but there does not seem to be any term other than the *dollar* by which to gauge the tremendous research activities now being carried on in the laboratories of private industrial firms throughout the country. And the dollar will not do as a standard, because the bare cost of the research written in figures gives us not the slightest conception of the nature of the research nor its objects; and these things are, after all, those we should be most concerned about.

Perhaps the nearest we may come to visualizing the research activities of private corporations is to thumb through this bulletin of the National Research Council, which lists a thousand industrial research laboratories and outlines the class of work being carried on in each case. Over nine hundred American manufacturing concerns are listed, alphabetically arranged; sprinkled through them are a comparatively few consulting laboratories not connected with any manufacturing enterprise.

Here, arranged for convenient reference, are the industrial firms in this country that are laboring to develop their products, to develop new methods of making their products, to develop new uses and markets for their products, to develop new by-products. There are only one thousand of them, but their research represents a mighty force in American industry, a force that is employing science to drive industry forward.

The research staff of each firm is given and a proportion of time is mentioned to indicate how much actual research is being done in each laboratory; that is, work in addition to the usual laboratory routine. A handy index by subjects is also provided, by means of which we learn that the laboratories of over fifty concerns are devoting all or part of their time to research on textiles; that more than fifty laboratories are studying dyes and intermediates, and that a few others not included in these two classifications are also studying rayon, silk, wool and laundering.

The first edition of this index, compiled in 1920, listed about 300 industrial research laboratories. The second, prepared in August, 1921, listed 526. The present revision nearly doubles that total. Surely, the research idea has taken firm hold on the industry; and, we might add, industry in turn has taken firm hold of the research idea. The period of greatest growth has been the past five years.

Automatic Combustion Control for Boiler Furnaces. Bulletin No. 660. Leeds & Northrup Company.

Modern boiler practice in large plants demands a degree of exact control which is practically impossible of attainment with manual methods. This bulletin describes an automatic system of metered combustion control for boiler furnaces. An electrical current controlled by steam pressure and flow in the steam main co-operates with air or gas flow meters, furnace pressure meters and stoker or fuel feed meters to regulate stokers, fuel feeders, fans and dampers as required to preserve constant steam pressure, to secure the desired division of load among boilers, to insure the most favorable furnace percentage of excess air or CO_2, and to hold the most favorable furnace pressure. Apparatus and hook-ups are shown for both stoker and powdered fuel plants, also steam flow and pressure charts and CO_2 records illustrating the results attained in commercial plants under automatic control.

ON PROCESS STEAM

A bulletin describing a new line of products for "process steam" pressures used in connection with chemical and textile processing has been issued by Warren Webster & Co., of Camden, N. J. The products are known as Webster Series 78 Thermostatic Traps. The bulletin discusses briefly the problem of securing efficient steam circulation at "process" pressure, outlines the methods used and describes in detail the construction and performance of the thermostatic traps. It is illustrated with diagrams of the apparatus.

NEW BUSINESS BOOK INDEX

The Business Branch of the Newark Public Library has just issued a 600-page volume, "Business Books; 1920-1926. An Analytical Catalog of 2,600 Titles." It was compiled by members of the staff of the branch, and supplements "2400 Business Books," issued in 1920, which in turn was a revision of "1600 Business Books," issued first in 1916 and in a second edition in 1917.

The number of books available on business subjects

has multiplied so rapidly in the last few years that a fourth revision of the original list was impracticable. The new volume, largest of the four, lists only books published since the third revision.

Besides listing every book both by its title and by its author, giving price, publisher, size and date of publication, the catalogues analyze the book, separating the topics dealt with, and entries run to over 100,000.

RECENT PATENTS

A Process for Finishing Viscose Fabrics

(1,633,152; June 21, 1927)

William Witte, of Providence, R. I., assignor to the United States Finishing Company, of New York, N. Y., a corporation of Connecticut.

This invention relates to a process of finishing cloth, and more particularly to the process of treating reformed by regenerated cellulose fibers to remove the lustre, and to the fabric and composition.

The manuufacture of the artificial silk is commonly conducted from cellulose by first rendering the cellulose soluble by forming a soluble cellulose-substitution product, then forming the substitution product into the requisite fine fibers, and subsequently removing the substituted radicals to reform the cellulose. Such a product may be termed a reformed cellulose, and bears the trade name of viscose fibers. It has a fine texture and high luster comparable to silk. Such a fiber, however, while it may be used to imitate lustrous silk fabrics, has not heretofore been capable of satisfactory manufacture into lusterless fabrics.

It is an object of this invention to treat viscose fibers to remove the luster while retaining the softness and strength.

For many puurposes, moreover, it is desirable to form a fabric with varied patterns, including portions having luster and portions devoid of luster. Such fabrics may be made by combining in a Jacquard loom fibers which in themselves are lustrous with those which are not. Such manufacture, however, is so expensive that it is, for many purposes, prohibitive.

Method of Delustering the Viscose

It is a further object of this invention, therefore, to devise a method for removing the luster from such fibers, which is adapted to a printing process, so that the gloss can be removed from a woven fabric in any printed pattern desired.

It has furthermore been found that such viscose fiber, when delusterized, possesses other physical properties which are advantageous.

The deglossing operation in accordance with this invention is apparently an operation of changing the exterior surface of the individual viscose fibers into a substitution product devoid of luster, but the complexity of the cellulose molecules is such that it is difficult to determine just what substitution has taken place.

The process finds the most useful application in the production of a damask effect upon viscose fabrics by printing. It will therefore be here illustrated as specifically carried out in a printing operation.

One such practical method of carrying out the process is as follows:

There is a mixed solution of a suitable alcohol, such as 90 per cent ethyl alcohol and 10 per cent caustic soda, to form an alcohol-caustic solution. This is then mixed with a suitable thickening agent and solvent—a practical mixture being 50 grams of the alcohol-caustic solution, 25 grams of gum sandarac, 24 grams of ethyl alcohol and 1 gram of pyridene. The use of the gum renders the composition viscous and suitable for printing, and it is desirable where the printing compound is in itself not sufficiently viscous.

The composition may then be printed upon the fabric in the same manner that dyestuffs are printed. The fabric is then preferably dried to prevent spreading of the design, although satisfactory results can be obtained without drying, if care be taken in the manipulation. The results of the above step are believed to be the formation of an alkali substitution product of the substance of the fibers, although in all probability this reaction is a surface action only.

The fabric so treated may then bs subjected to a bath capable of effecting the final substitution. A bath suitable for this purpose may be formed by dissolving in carbontetrachloride 10 to 25 per cent of para-toluene-sulphochloride. This bath is preferably used at a temperature of from 100 to 150 deg. Fahr., and the fabric need be subjected thereto only for a short period. It is then wrung out and rinsed in a 5 per cent soda ash solution, both at approximately 180 deg. Fahr., until it is free from odor and from the reagents of the prior baths.

By the above treatment it will be found that those portions of the cloth on which the caustic-alcohol solution was printed have lost the luster, but maintain their softness and strength.

Since certain changes may be made in carrying out the above process without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Retted Bagasse Fiber, and Process of Producing Same

(1,633,594; June 14, 1927)

Elbert C. Lathrop, Philadelphia, Pa., and Treadway B. Munroe, Forest Glen, Md., assignors, by direct and mesne assignments, to Dahlberg & Co., Inc., Chicago, Ill.

The process of preparing fiber producing material for the production of pulp which consists in subject-

ing said material to the fermenting action of micro-organisms of the mushroom type.

Manufacture of Vat Dyestuffs

(1,633,997; June 28, 1927)

Paul Nawiasky, Ludwigshafen-on-the-Rhine, Karl Zahn, Hochst-on-the-Main, and Karl Saurwein, Ludwigshafen-on-the-Rhine, Germany, assignors to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany.

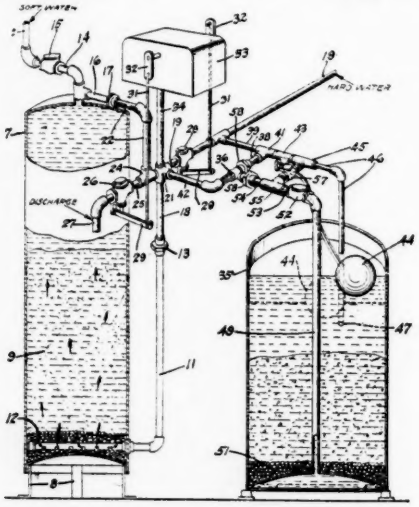
As a new article of manufacture a vat dyestuff which can be obtained by acting on Bz-1-chlor-Bz-2-methoxybenzanthrone with an alkaline condensing agent and which dissolves in concentrated sulphuric acid with a claret red coloration and dyes cotton from a blue vat blue shades which by oxidation turn to a bright greenish blue.

Control Mechanism for Water Softeners

(1,632,610; June 14, 1927)

Lynn G. Lindsay, Minneapolis, Minn.

A device of the class described comprising a bed tank having a hard water supply pipe, a valve for said pipe, a brine tank, pipe connections between the hard



water pipe and brine tank, including an injector arranged for sucking brine from the brine tank when the hard water valve is closed, an auxiliary hard water pipe within the brine, a valve in the auxiliary line controllable by brine level, and pipe connections between brine and auxiliary hard water pipes, including automatically operable valves adapted to open toward the injector.

Composition for Impregnating Fibrous Materials

(1,634,002; June 28, 1927)

Willem Tom, Katwijk aan Zee, Netherlands

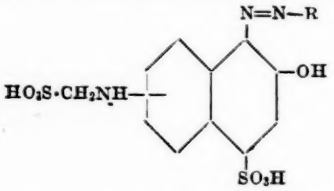
A composition for impregnation of fibrous materials or articles made from fibrous materials consisting of a homogeneous mixture of 15 to 30 per cent of paraffin, 6 to 15 per cent petroleum jelly, 3 to 10 per cent naphthalene and turpentine.

Chromable Azodyestuffs Derived from Formaldehyde Sulphurous Acid and Nitrated 1-(Azo-Naphthol)-2-Hydroxy-Naphthalene-4-Sulphonic Acid, and the Process of Making Same

(1,633,874; June 28, 1927)

Fritz Straub, Basel, and Hermann Schneider, Riehen, near Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel, Switzerland.

As new products the herein-described new azo dyestuffs corresponding very probably with the general formula:



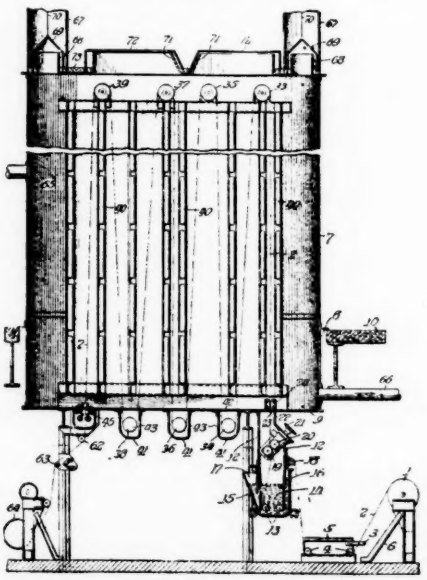
wherein R stands for the residue of an unsulphonated naphthol, which products form black powders which dissolve in water to violet-brown solutions, in dilute caustic soda solution to black and in concentrated sulphuric acid to blue solutions, and which dye wool, when afterchromed, very fast black shades which are particularly fast to potting.

Apparatus for Coating and Drying Fabric or the Like

(1,632,760; June 14, 1927)

Robert R. Jones, Akron, Ohio, assignor to the Firestone Tire & Rubber Company, Akron, Ohio.

An apparatus for coating and drying fabric, or the like, comprising a drying chamber, a coating tank outside said drying chamber, a passageway being provided from the tank to the chamber, wall about



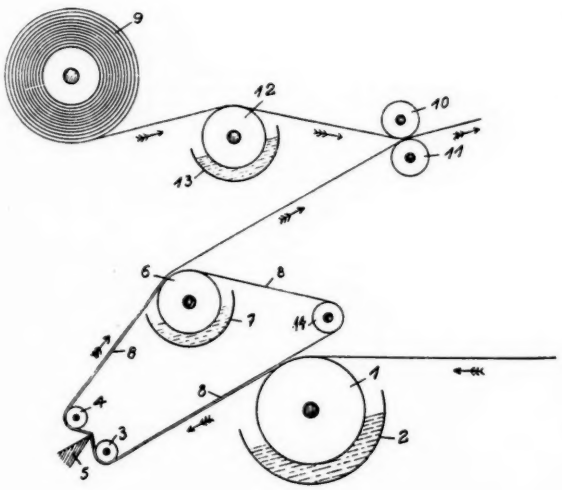
said passageway extending within the liquid in the tank to form a seal and a second seal in the passageway above the tank, and means to operate the second seal to close the passageway.

In a drying apparatus, having means for supporting and guiding fabric and a passageway through which the fabric leaves the apparatus, and a seal at the passageway, said seal comprising wipers which bear against the fabric and fluid expansible means for pressing the wipers against the fabric.

Technical Notes from Foreign Sources

Waterproofed Fabrics for Bags

In the manufacture of waterproofed fabric for bags and the like, which fabric, for example, is made from the jute fiber or the like, and also a layer of paper, a waterproofed coating is applied between the two layers of fiber with the aid of pitch or tar. In order to prevent the tar or pitch from penetrating through the paper or the fabric, a special process has been devised which is patented in German Patent No. 438,970, and which is carried out by means of an apparatus shown in the accompanying illustration.



The jute fabric on the side which is not coated with the waterproofing mixture is cooled with water after the coating has been applied, and this results in the pitch or tar solidifying very quickly. The fabric is shown entering the apparatus at the left lower corner; it passes over the roll 1 which dips into the trough 2 which contains the coating materials. The fabric then runs in an endless band over the rollers 3, 4, 6 and 14 and comes into contact with a felt which is kept in a moist condition by means of the roller 6 which rotates in cooling water. The paper web runs off from the roll 9 and passes over the roller 12 which likewise dips into a trough 13 and thus the paper is coated with the waterproofing mixture. Between the roller 10 and 11 the fabric and paper webs are combined and a firm union is effected between the two due to the adhesive character of the coating on their inner surfaces.

New Development in Printing with Basic Dyestuffs

The basic dyestuffs are generally used in the form of their salts. This form of the dyestuff cannot, however, be used with mordants in the printing process, for the reason that the mordants very rapidly form color lakes with the dyestuffs which are difficultly soluble. The solubility of these color lakes in the thickening agents and other ingredients of the color pastes is extraordinarily slight, with the result that it is impossible to color the fiber in this manner. This phenomenon is particularly manifested in the case of mordants which contain sulphur in combined form; that is, the mordants obtained from phenols and amines which are melted with alkali sulphides.

It is therefore necessary to use two baths when these substances are employed as mordants, so that the goods are treated with these mordants either before or after the printing process proper. It has been found, however, that this formation of lakes does not take place when the basic dyestuffs are used in the form of their free bases, and consequently that this disturbing phenomenon can be easily avoided in this manner.

The free color bases are mostly sufficiently soluble in the printing paste without being subjected to any preliminary treatment. In certain instances it has been found advisable to convert the free bases by reduction into their leuco compounds, for in this way the solubility of the dyestuff in the printing paste is often considerably increased.

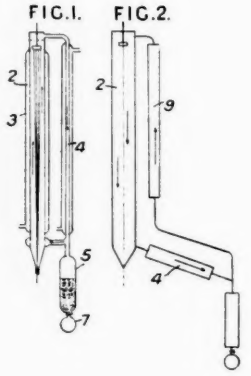
The process of using these free bases is as follows: The dyestuff is first dissolved in water and the solution is then mixed with the neutral thickening agent while being vigorously stirred. Then enough of a sodium hydroxide solution is added as is necessary to set free the color base. A small excess of sodium hydroxide is advisable under these conditions. It is also frequently advantageous to add a small amount of hydrosulphite in order to convert the color base into the leuco compound.

Thereafter the mordant is added to the mixture and the printing paste is then ready for use. In order to brighten and deepen the color in the printing fabric it is advisable in certain cases to add a little soap to the printing paste. After the goods have been printed they are allowed to remain at rest for a period which varies between twelve and twenty-four hours,

and during this time they dry. They are then steamed and it is then that the actual development of the color takes place, which is accomplished by treatment with acetic acid and bichromate, followed by washing and soaping. (The Dyer and Calico Printer through Der Textilchemiker und Colorist, 1927, p. 83.)

Filament Making Apparatus

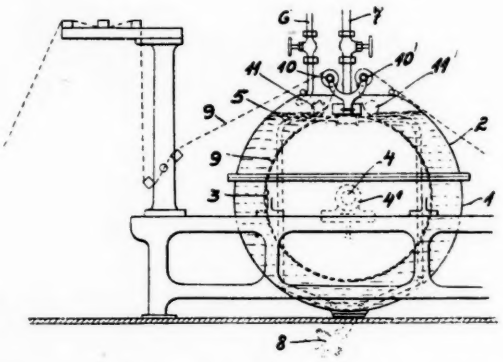
For carrying out the dry spinning of rayon according to a method in which the solution of cellulose acetate, etc., is spun into an atmosphere which is already richly laden with solvent vapors, there is employed a system comprising a spinning cell (Fig. 1), which is provided with heating means such as a jacket 3, a condenser 4 connected to the upper and lower parts of the cell, the circulation of the atmosphere taking place automatically and in an upward direction in the cell.



An alternative system comprises a spinning cell 2 (Fig. 2), which may be heated or unheated, a condenser 4 connected to the lower part of the cell, and a heating apparatus 9 which is connected at one end to the lower part of the condenser and at the other end to the upper part of the cell. In this system the circulation of the atmosphere is automatic, but the movement is downwards in the cell. In order to prevent the escape of solvent through the orifice through which the filaments leave the spinning cell, it is convenient to maintain a slight depression therein by withdrawing a small amount of the atmosphere at a suitable point in the circuit. The condensed solvent is collected in a receiver 5, from which it can be transferred to a collected 7. (British Patent No. 269,377.)

Fixing Woolen Fabric by Boiling Wet Treatment

The machine which is used in fixing textile fabrics and particularly woolen goods by means of a boiling wet treatment is shown in the accompanying illustration and is patented in German Patent No. 439,149. The machine is constructed in such a manner that the liquid container 1 and 2, which holds the boiling hot liquor, is made in the shape of a drum and the guide rolier 3, which is built into this container, is also made in the form of a rotable drum. The fabric that is passed through the apparatus and that comes into contact with the roughened or corrugated surface of the inner drum is thus thoroughly impregnated with



the liquor. The same effect is also obtained when the guide roller 3 is made with a perforated jacket and when the interior of this jacket is provided with a water-tight arrangement for removing the liquor.

A heating system is built into the inner part of the container, shown at 5, for heating the liquor with the aid of steam. The pipe 6 leads the boiling liquor into the interior of the apparatus and the pipe 1 leads steam to the heating coils. The run-off valve is shown at 7.

The machine operates in the following manner: The fabric 9 is passed over the guide roller 10, passes through a narrow opening over a second guide roller 11 and passes over the drum roller 3. It then passes out of the apparatus through the same narrow opening and over the guide rollers 10' and 11' and thus leaves the apparatus. This makes it possible to obtain a continuous fixing of the fabric with the consumption of a minimum quantity of the boiling liquor. This effects a considerable saving in steam.

Sources of Error in Dyeing

Woolen yarns which are spun from non-uniform raw material or which have not been uniformly twisted will not dye regularly. It is also important to use the proper variety of spinning oil. It is also true that irregular raw materials will cause faults in the dyeing of piece goods. The use of poor grades of warp size will also have this effect. This holds good for fabrics which are made from one fiber as well as those manufactured from more than one fiber. The greatest difficulty is that the errors are first detected after the materials have been finished.

In investigating errors that are made in the dyeing plant itself, one of the first points to be considered is the condition of the water employed in making the dye liquor. It is really not necessary to mention that this water should be as soft as possible and clean. The importance of having good water was clearly illustrated in one case of dyeing half-silken ribbons.

The various parts of the process through which the ribbons were carried were investigated and all were found to be perfect with the exception of the water. The water was found in this case to contain a certain amount of greasy matter, and it was then easy to see that the fabric acted as a filter and removed this grease from the water, to the detriment of the dyeing.

Care must be taken in the boiling-out and bucking treatment in pressure kiers. The sides of the apparatus must be clean, and absolutely free from rust. The goods must be carefully filled into the kiers so as to avoid air pockets which tend to promote the formation of oxycellulose. The bleaching process is also discussed from the standpoint of errors made in subsequent dyeing.

As far as the dyeing itself is concerned, it is essential that the dyestuff be completely dissolved. Stationary baths must not be used for too long a time for there will be an accumulation of salts in them, which gives a dirty dyed fabric. When Glauber salt is used in conjunction with a soap liquor, it is essential to examine the salt before use, for when the commercial product contains magnesium sulphate, insoluble magnesia soaps are formed, which, aside from loss of soap, cause faulty dyeing. The soap must not contain any free alkali nor unsaponified matter. The temperature at which the soap becomes turbid must be as low as possible, from 25 to 32 deg. Cent., and never over 40 deg. Cent. (Deutsche Faerber Zeitung, 1927, pp. 553-554.)

Identifying Vat Dyestuffs on the Cotton Fiber

It is often desirable to determine the character of the dyestuffs used in the dyeing and printing of cotton as well as other textiles. A method is described in Melliand's Textilberichte, 1927, pp. 611-619 for determining the exact character of the vat dye used on cotton fiber. A long list of vat dyestuffs with their characteristic color reactions is given.

The method is as follows: A sufficient number of samples of the dyed or printed cotton are first prepared. Then one of these samples is boiled with a solution of sodium hydrosulphite or sodium formaldehyde hydrosulphite and the color change is noted. The test is repeated with the boiled-off fiber that is obtained in this manner, a solution of caustic soda of 40 deg. Be. being used for the purpose. A second portion of the cotton is boiled with 40 deg. Be. concentrated sodium hydroxide solution. A third sample is tested in a test tube with concentrated sulphuric acid, and the color change both in the fiber and in the solution is observed. A fourth sample is tested with a drop or two of concentrated nitric acid in a watch glass. The fifth sample is boiled with benzol and the color of the solution obtained is observed. The sixth sample is boiled with pyridine base and the color of the solution was observed. The solution that was obtained in this manner was treated with sodium hydroxide solution of 40 deg. Be. concentration and the color change was observed; that is, the color change in the pyridine solution and also in the fiber, which has not been completely stripped of color.

The reagents used in the experiment were a concentrated solution of sodium hydrosulphite, sodium hydroxide solution of approximately 35 per cent concentration, concentrated sulphuric acid of 96 per cent concentration, concentrated nitric acid of approximately 65 per cent concentration, chemically pure benzol and technical pyridine base. The color reactions are noted and compared with the information given in the tables that accompany the article and that identify the dyestuff. In cases where it is difficult to tell between various marks of the same dyestuff, it is necessary to carry out an actual dyeing test to determine what color was originally used on the material.

Sizing Rayon

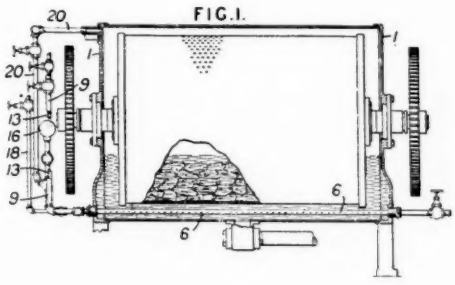
Pastes which contain glue or gelatin are much more suitable than those which contain ordinary starch for sizing rayon yarn, so that it retains its luster and acquires suitable elasticity for the purposes of weaving. Suitable sizes are prepared by boiling 1 kilogram of bone gelatin, which has been previously steeped in cold water for a period of twelve to twenty-four hours, 1 kilogram of gelatin and 24 liters of water. Then 200 grams of olive oil are added as well as 50 grams of anhydrous sodium carbonate and 100 grams of glycerin. Then again another size is prepared from 2 kilograms of glue, which has been previously steeped in cold water for a period of twelve hours. The glue is boiled with 25 liters of water, and then 500 grams of Marseilles soap and 150 grams of Brilliant Monopole Oil G are added. Both sizing preparations are employed at a temperature of 50 deg. Cent. (Kunstseide, Vol. 8, pp. 319-320.)

Washing Machine with Enclosed Rotary Receptacle

Washing machines with enclosed rotary receptacles are provided with means for injecting and distributing steam, compressed air, atmospheric air or any mixtures thereof into the washing, bleaching, etc., liquids to agitate them and, in the case of liquors, to break up the suds and revivify them.

The distributing pipe 6, having downwardly direct-

FIG. I.



ed perforations, is connected to steam supplies 9 and 13, a compressed air supply 18, and to atmosphere through a strainer 16. The compressed air and the steam supply 13 feed through an injector through which the atmospheric air may be induced, the steam supply 9 feeding into the pipe between the injector and the casing so that an independent supply of steam is available for heating the liquids. A pipe 20 leads from the top of the stationary casing 1 into the air pipe between the strainer and the injector so that when the machine is used for bleaching operations, vapors rising from the liquids can be injected and recirculated. (British Patent No. 269,422.)

MILLS AND MEN

Former Collector of Internal Revenue Charles V. Duffy, of Paterson, has been named receiver of the Premier Dyeing Company, Inc., West New York, N. J., under bond of $25,000, on petition filed by Hyman Rosenblatt, of Paterson. Harry Joelson, president, and Charles Sands, secretary, filed a consent to the appointment. The company's overhead is declared to be too great for the capital.

The Dixie Mercerizing Company, Chattanooga, Tenn., has let contract to the Mark K. Wilson Company, of Chattanooga, for construction of the addition to its single yarn mercerizing plant.

That S. Slater & Son, of Massachusetts, contemplate the possible construction of a bleachery at Marietta, S. C., was indicated last week by the announcement from W. C. Beacham, chairman of the City Water Commission, that the Slater interests had made inquiry as to the water rates for Marietta. They had indicated that a bleachery might be established, and if so, water would be secured from the city lines, which bring the water from the Blue Ridge Mountains, a distance of nearly thirty miles. The two bleacheries now in Greenville County have their own water sources, not being dependent upon the city water system.

Dr. Edward R. Weidlein, director of Mellon Institute of Industrial Research of the University of Pittsburgh and president of the American Institute of Chemical Engineers, will spend September and October in visits to European educational institutions, research laboratories, and chemical works. Dr. Weidlein plans to leave for England on September 3 and to remain there for about two weeks. His continental trip through Germany, Switzerland, Italy and France will follow.

The Glasgow (Conn.) Finishing Company has resumed full-time schedules.

The National Yarn & Processing Company, Rossville, Ga., which has been carrying on an expansion program for some time, will enter the single ply yarn field as soon as the additional machinery, now being installed, is started up. Work included the construction of a new warehouse and office building, and installation of a Smith skein mercerizing machine and a skein dyeing machine. The new machinery will increase the capacity of the plant about 1,500 pounds of yarn a week.

The Diamond Silk Dyeing & Finishing Company, Inc., West New York, N. J., is reported to be planning the construction of a one-story addition to its plant. Application has been made to the city zoning board for permission.

E. H. Leftwich has resigned his position with the Union Bleachery, Greenville, S. C., to become overseer of dyeing at the Great Falls Manufacturing Company, Rockingham, N. C.

The French Hand Printing Company, Paterson, N. J., recently organized with a capital of $25,000, to operate a print and dye works, will be represented by Victor Delorme, 1061 E. Twenty-fifth Street, Paterson, one of the incorporators.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

INSTRUCTOR

Wanted—Ph.D. with knowledge of Textile Chemistry and Dye Application to teach and act as research associate in technical school. Address Box 412, American Dyestuff Reporter.

DYE CHEMIST

Chemist with practical experience in the manufacture of alizarine or vat colors is required by domestic manufacturer of these colors. Please state general qualifications, experience, age, salary desired. Address Classified Box 413, American Dyestuff Reporter.

CHEMIST

WANTED—Chemist with knowledge of textile chemistry, dyeing and bleaching. State qualifications, age, salary. Good opportunity. Address Box 416, American Dyestuff Reporter.